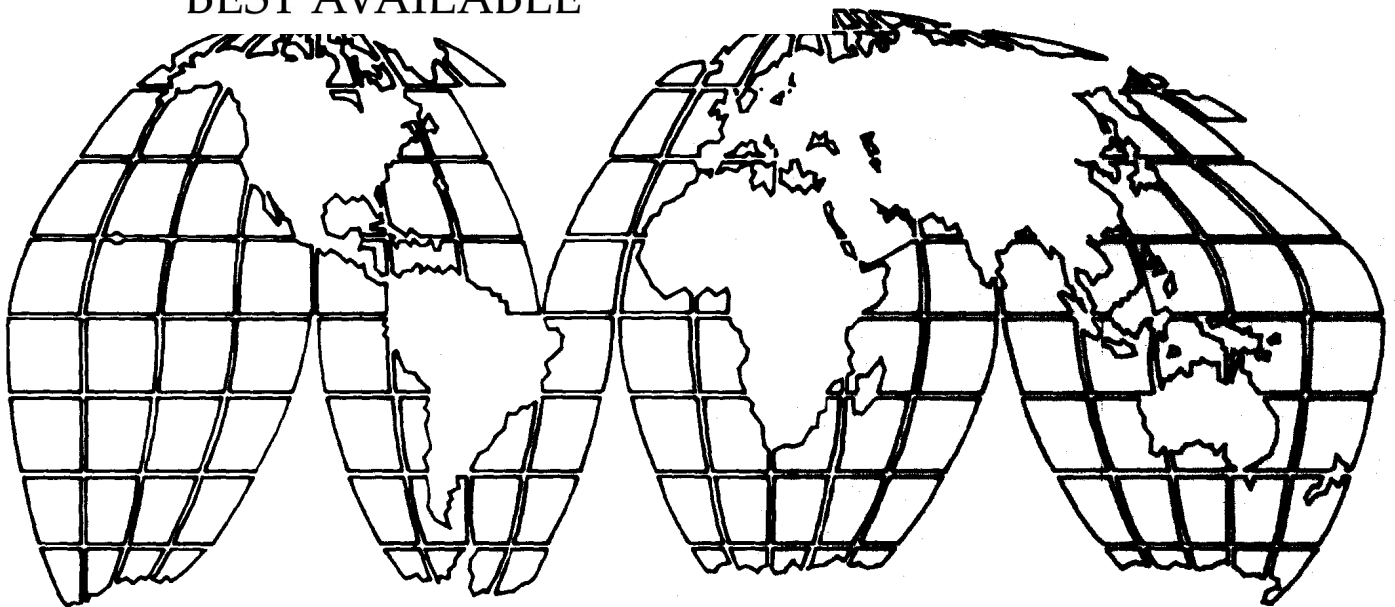


A.I.D. Program Evaluation Discussion Paper No. 6

# **The Sociology of Pastoralism and African Livestock Projects**

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May 1979

Office of Evaluation  
Bureau for Program and Policy Coordination  
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THE SOCIOLOGY OF PASTORALISM  
AND AFRICAN LIVESTOCK PROJECTS

by

Michael M. Horowitz

A.I.D. Program Evaluation

Discussion Paper No. 6

The Studies Division  
Office of Evaluation  
Bureau for Program and Policy Coordination  
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May 1979

## CONTENTS

Introductory Notes

Preface

- Chapter I.        Development Interventions in the Livestock Sector
- A.    The AID "Strategy"
  - B.    A Classification of Interventions
    - 1.    Improvements in Livestock Infrastructure
    - 2.    Replication of Western Commercial Production Systems
    - 3.    Innovations in Organizational Systems
- Chapter II.       The African Herdsman: a Portrait Derived from  
Development Documents
- Chapter III.      Commissions, Omissions, and Assumptions in Livestock  
Development Strategies, Programs, and Projects: a Critical  
Examination
- A.    What about Desertification?
    - 1.    Ecology and Desertification
    - 2.    Anti-Nomadism
    - 3.    Range Use
    - 4.    Labor Constraints
    - 5.    Herd Composition
  - B.    How Common is the Range?
  - C.    Why is Offtake Low?
  - D.    What about Mobility?

E. Who are the Chiefs?

F. What about Women?

G. Are there Problems with Mixed Farming?

Chapter IV. Conclusions and Recommendations

References Cited

## Introductory Notes

### Background Note on the Office of Evaluation and Its Discussion Paper Series

The primary objective of the Agency for International Development's Office of Evaluation is to provide AID management with usable analyses of the intended and unintended impact of aided projects, programs, policies and procedures. It is our intent that lessons gleaned from AID's past inform present planning.

The Office tailors its approach to suit the nature of a problem, its urgency, and the type of data available. After identifying a problem and ascertaining management interest in it, the Office's staff normally links up with or establishes a network of AID and non-AID experts. The staff also reviews information from the Agency's automated data base systems and assembles documents including project papers, project evaluations, and special studies sponsored by other parts of the Agency. In conjunction with this the Office commissions discussion papers by experts who are familiar with the past efforts of development agencies as well as with the problem. It may also hold workshops and conferences and, if necessary, carry out field studies of past projects and programs. The Office does not sponsor basic research on development but concentrates on analyzing available information.

Findings are issued in discussion papers, workshop and conference reports, circular airgrams, action memoranda, sector and subsector studies, and case studies. They are intended to stimulate discussion and innovation and to encourage experimentation. They do not constitute formal guidance unless they are explicitly cleared and issued as such.

The purpose of the series of discussion papers prepared for the Office is to stimulate thought and dialogue on a problem by exploring past experience from new perspectives. Consequently, we have encouraged authors to be constructively critical, to examine explicit and implicit assumptions that are usually taken as given, to look for unrecognized and often cross-sectoral linkages, to examine host-country institutional factors, to examine the way AID's organization, staffing, and procedures affect our effectiveness, and to identify for further examination alternative approaches and policy options.

Because the discussion papers are exploratory they are not intended to be comprehensive in coverage, conclusive in their argument, or primarily technical in orientation. They are intended to help formulate additional hypotheses for testing and to assess what additional work needs to be done on the problem. We hope that the discussion papers will help stimulate innovative and more effective programming and project design in our overseas missions. The papers also will be of interest to scholars carrying out research on development.

Most importantly, however, we hope that the papers will elicit responses from our readers--responses that will confirm or refute assertions, refine or add issues to be analyzed, and suggest case studies necessary to resolve issues.

#### About the Author

Michael M. Horowitz, social anthropologist and cultural ecologist, is Professor of Anthropology at State University of New York at Binghamton and President of the Institute for Development Anthropology. He has carried out field research among peasant farmers in Martinique and among herdsmen and farmers in Niger. He is the author of MORNE PAYSAN: PEASANT VILLAGE IN MARTINIQUE (1967); MANGA OF NIGER (1973); co-author of THE ANTHROPOLOGY OF RURAL DEVELOPMENT IN THE SAHEL (1977); and editor of PEOPLES AND CULTURES OF THE CARIBBEAN (1971) and THE EFFECTS OF DROUGHT ON PRODUCTIVE STRATEGIES OF SUDANO-SAHELIAN HERDSMEN AND FARMERS (1976). In 1974-75 he was regional anthropologist and director of social science research for AID's Regional Economic Development Services Office for West Africa, based in Abidjan, and he directed the socio-economic studies on Mali Livestock I and Dogon Cereals. Professor Horowitz, who received his Ph.D. from Columbia University in 1959, is a member of the National Academy of Science's Advisory Panel on the Sahel, the executive committee of the American Council on Education's Overseas Liaison Committee, and has been a consultant to the World Bank and to the United Nations Environmental Programme. He is currently a consultant to AID's Office of Evaluation.

The views and interpretations in this publication are those of the author and should not be attributed to the Agency for International Development.

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They are in no way to be held responsible for any of the conclusions of this report. Mr. James Bingen, AFR/SFWA/SDP, commented extensively on a draft version, and pointed out a number of inelegancies of presentation. I hope I have caught most of them.



The terms of reference for this report ask for a review of the state of current knowledge concerning the social and economic impact of livestock<sup>1</sup> projects on low income people, drawing mainly on materials from Niger, Upper Volta, Benin, Togo, the Ivory Coast (these five countries comprising the Conseil de l'Entente, among whose activities is a livestock marketing project), Sudan, and Somalia. The following information is to be included:

A. Using documents made available by AID, the report is to:

1. analyze the assumptions about the behavior and needs of intended beneficiaries that are explicit or implicit in the way projects are designed and implemented;

2. identify indicators that might allow for an assessment of the socio-economic impacts of these projects on the intended beneficiaries and their environments;

3. analyze variations in socio-economic impact in relation to variations in design, implementation as well as in historical, political, ecological, sociological, and economic conditions.

B. Based on the description and analysis in Part A, the report is to discuss lessons that have been learned and issues which remain outstanding.

C. Finally, the report will recommend what further action is required, including field visits, adequately to assess the impact of livestock projects on low income populations, specifically though not limited to the seven countries listed above.

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<sup>1</sup> By "livestock" we mean large and small ruminants. We have not considered essays in the realms of fish, fowl, and swine, nor attempts at domesticating wild ungulates.

The major problem faced in preparing this report has been the unavailability of information at AID. This is hardly a novel observation, but it is perhaps worth stating once again:

- AID historically has not undertaken systematic evaluation of projects once they have been implemented; on the basis of Agency documents alone it is not possible to determine whether projects met their stated objectives, let alone whether they had unanticipated and undesired consequences.

- AID's ability to store and retrieve such documentary information as does exist about its own programs and projects is poor.

The fact that despite the Agency's shortcomings in documentation we were able to examine a number of projects is attributable to the excellent cooperation received from the staff of PPC/E/S, and especially Ms. Elizabeth Hunt.

The second problem faced in this report is the shallow time depth for most of the specifically AID projects we examined, and the far longer time required for them to show evidence of having their desired impacts. The programs in Sudan and Somalia are just now starting up, after a gap of quite a few years. Similarly, although AID has maintained a continuous Sahelian presence since the programs began in the early 1960s, the level of activity increased markedly subsequent to the drought and the establishment of the Sahel Development Program. Thus, of the five West African countries dealt with in this respect, only Niger has a full "range and livestock" project, similar to those underway in other semi-arid African countries (particularly World Bank projects in Mali, Upper Volta, and Senegal, and soon in Chad and Niger), and that project has not yet been implemented.

There is an opportunity for the Agency in the fact that the projects are recent, and that some of them are not yet off the drawing boards, for there is still time to be flexible, to be sensitive to the likely impacts -- both positive and negative -- that these projects may have, and to make whatever modifications are called for to maximize the former and minimize the latter.

In order to overcome some of the limitations posed by the lack of documentation and the recency of the major interventions, we will not cling rigidly to an examination of the livestock projects in the seven countries.<sup>2</sup> Without pretending to have achieved a comprehensive review, not even for each of the countries of major focus, we shall draw on examples and understandings derived from other countries in order to inform on the central issue of this report: *what assumptions are being made concerning the sociology and cultural ecology of pastoral production which underlie interventions in the livestock sector; what are the discrepancies between those assumptions and the understandings of pastoralism that have emerged in current scholarship; and, to the extent the data permit, what are the consequences of these discrepancies.* It is important to underscore current, because solid environmental, agrostologic, ethological, and sociocultural analyses which illuminate the probable consequences of interventions have not been many. That, of course, does not exempt the planners from the responsibility to have taken into account that information that was available, or to have invested in the means of obtaining it prior to large-scale intervention. This point was made over twenty years ago, by Frankel assessing the Kongwa Experiment in the East African Groundnuts Scheme: "It cannot be too strongly emphasized that those

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<sup>2</sup> Because the Entente Livestock Project is the subject of a major review being undertaken by the University of Michigan's Center for Research in Economic Development, I have omitted consideration of it in this report.

who were asked to implement the plan were unable at any time to escape from the fundamental concepts on which it was originally based. Whatever mistakes were made were due primarily to the nature of the task, not to the men who had tried to carry it out..." (cited by K. D. S. Baldwin, who goes on to attribute the failure of a highly touted agricultural project in Nigeria to "a failure to improve on local African agriculture. The plain truth is that very little, if anything, was known before the scheme started about the existing agriculture in the Mokwa area..." [1957:166]).

Two decades later, David Shear repeats the warning: we ignore the local scene at our peril.

Planning from the top down, while useful in identifying macro constraints to development, clearly has severe limitations. Local societies can be changed and even destroyed by the development process. The impact which technological change brings about at the village [or to the pastoral group: MMH] is rarely well understood. And indeed the lack of local feedback and evaluation often brings about significant dislocations at the local level and can presage the doom of any large-scale development effort from the outset (Shear 1978:4).

It is the sad finding of this report that development interventions in the livestock sector in Africa have been too often classic instances of top down planning with exactly the negative consequences that Shear predicts. It is the hope of this report that it will contribute to the growing sentiment within the development community that successful, equitable rural development is of necessity "development from below".

## Development Interventions in the Livestock Sector

### A. The AID "Strategy".

AID has not elaborated a formal strategy for the livestock sector. It is thus difficult to establish yardsticks against which to measure project claims. These claims are complex and sometimes even contradictory. That is, there are fundamental problems in the conceptualization of projects which are quite independent of the added difficulties of poorly understood ecological systems and sociocultural organizations, inadequate numbers of host country personnel, particularly at the middle managerial level, and poor infrastructure. Livestock projects have been supposed, simultaneously, to increase productivity, reverse the ecological deterioration of the range, shift production from a di Previous Page Blank ntation, improve producer income and quality of life, maintain a regular supply of cheap meat for the internal market, and increase the supply of high quality meat to the export market. Each of these goals is admirable; they do not tend to pull in concert, however, but in competition.

In the absence of a formal strategy, we have attempted to infer one from the DAPS and CDSSs, from various statements which have been floated as strategies (such as D. S. Ferguson 1977?; F. Abercrombie and G. B. McLeroy 1974), and from the project documents themselves. In the Sahel, AID identifies its livestock strategy with that of the Club du Sahel, a most recent presentation of which is Examen de la Stratégie de Développement de l'Elevage au Sahel et des Dossiers de Projets de Première Génération (Paris: OECD, April 1978).

The goals of that strategy are primarily:

to increase livestock production to meet growing internal and export demands in each Sahelian country while seeking to improve per capita protein consumption in the Sahel. The secondary objectives of the strategy include recommendations:

- to improve the availability of cattle for use in animal traction;
- to increase the income and quality of life of livestock owners (Sahel Development Program Annual Report to the Congress, AID/W, 1978, pages 25-26).

The Sahel Development Program Report for 1978 notes the difficulties in assessing progress rates:

- long lead time required between project identification, design, implementation and the realization of final project results;
- potential repeat of a major drought; and
- lack of accurate data on basic factors such as per capita income, income distribution, mortality and morbidity, productivity per unit land, and literacy rates (Ibid.:8).

In other words, while programs are ostensibly aimed at improving income and quality of life of the poor, AID is not clear as to who is poor, or what "poor" means in a rural African context. The Country Development Strategy Statement for Niger, 1978, ducks the issue altogether with the assertion that "...the rural population in its entirety is poor" (p. 2).

Given the very low level of national income, the question of equity has little relevance for the Niger scene at this point. While there are a few pockets of amassed wealth within Niger, those that do exist are in commercial areas which are relatively unlinked to the rural population. That is: neither exploitation of the rural people nor accumulation of individual wealth at their expense are problems in Niger (CDSS Niger, 1978:5).

It is understandable why AID has difficulty in defining poverty for, according to the Niger CDSS, the poor themselves, the "rural population in its entirety", do not even know they are poor: "It is not at all clear to what extent they are either aware of what has happened over the years or feel that they are living in poverty... Without such feelings there is little incentive for a society to demand or seek the necessary elements which would improve their condition" (Ibid.:7).<sup>3</sup>

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<sup>3</sup> My experience in that country leads to quite a different interpretation: that social stratification and the exploitation of the poor for the benefit of the rich -- including linkages between the peasantry and the commercial elite -- are intense within the rural areas, between rural and urban areas, and within the urban centers themselves. It is understandable, perhaps, that the intense wealth differentials which exist, and which indeed existed in pre-colonial times although they have become even more pronounced as a result of the colonial political economy -- escape the casual observer, deceived by superficial appearances of "generalized poverty". In fact, access to the major components of agricultural production -- good land, labor, tools, credit -- is severely differentiated throughout the country. Traditional elites, which had privileged access to resources in pre-colonial times, tended to have their advantaged positions reinforced by the colonial and independent economies. This can be seen most clearly in the commercial agricultural sectors of groundnut and, to a lesser extent, cotton production. The marketing cooperatives, which were touted as contributing to rural equity and local control, became mechanisms serving the interest of elites.

Elites control not only commercial production but also much of the internal

Because identification with the Club du Sahel's program for livestock development is the closest AID has come to elaborating a formal strategy of its own, it is useful to repeat it here:

The primary objectives of the Club's livestock strategy is to increase livestock production to meet growing internal and export demands in each Sahelian country while seeking to improve per capita protein consumption in the Sahel. The secondary objectives of the strategy include recommendations:

- to improve the availability of cattle for use in animal traction;
- to increase the incomes and quality of life of livestock owners.

To accomplish these objectives five areas for priority attention are identified:

A. The evaluation of natural resources potential and range management development for which the following specific actions are recommended:

- support for studies to improve our knowledge of the ecosystems and land use potential throughout the Sahel;
- establishment of a systematic link between research and range management projects to evaluate the impact of these projects on both natural resources and socio-economic conditions.

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(Cont.)

trade in food crops (despite the supposed government monopoly over grain sales, which itself rewards the already salaried civil service) and manufactured/imported items consumed by the peasantry (such as soap, cloth, kerosene, salt, sugar, tea, matches). Atomized into tiny production/marketing units, the peasantry has almost no leverage with which to influence its terms of trade. While much of the wealth of the merchants is hidden, their investments in dry goods, vehicles, real estate, most of which is supported by profits on the production of the peasantry, must be apparent to even our casual observer.

The assertion that the people do not know they are poor and therefore are unresponsive to changes which advantage them is pernicious, for it justifies the development from above posture which AID itself has elsewhere rejected.

Peasant farmers in the Sahel have become the objects, not the agents of agricultural development. While this approach has been successful in increasing the production of some commodities, notably peanuts and cotton, it apparently has failed to result in self-generating growth through farmer initiative. In contrast, the degree of local initiative in vegetable production and other areas generally neglected by the Sahelian governments, is impressive.

Thus, while the centralized agricultural extension structure may adequately provide inputs for farmers and support to extension agents, concurrently this same structure discourages independent, innovative efforts to adapt to local requirements and demands. Although extension agents are in direct contact with farmers when introducing improved production techniques, the rigid organizational hierarchy obliges the agents to be more responsive to administrative requirements than to farmers' problems (SDP Report 1978: 17-18).

B. Mixed Farming. The fostering of a greater association between agricultural (crop) and livestock production. To promote mixed farming, the Club strategy recommends assistance to:

- increase the availability of draught animals and assure that required animal health services are provided to reduce the risks of parasitic and infectious diseases;
- assist farmers to improve animal feeding, including sufficient animal water supplies near farm sites;
- develop credit systems to facilitate the purchase of equipment, animals and feed, as required;
- develop market outlets for mature oxen and grown-out animals;
- accelerate the adoption of improved production methods by encouraging the creation of producer associations capable of playing a more direct role in extension; and
- improve the productivity of on-farm production of small ruminants and other small stock.

C. Animal Health. The Club strategy recommends that each Sahelian government (over the next three years) undertake a preparatory phase of animal health delivery system development enabling them to:

- assure that animal health services are provided with required supplies and equipment;
- prepare a long-term program of disease/control/eradication;
- reorganize the animal health services as required to improve their capability to support animal production programs.

D. Training and Communications. While recognizing short-term needs for trained livestock service staff, the strategy recommends a long-term orientation which includes:

- manpower studies of future staff needs;
- improvement of teaching materials, upgrading staff and clinical facilities;
- continued use of scholarships for overseas training in specialized subjects;
- improvement of links between training institutions, research stations and user services; and
- strengthened training and communications services which permit producers to be more directly involved in planning and evaluation of development projects.

E. Marketing. While recognizing that most Sahelian governments favor public or parastatal livestock marketing organizations and cooperative groups of livestock-related professionals, the strategy supports:

- facilitating a dialogue between public and private marketing interests;
- reinforcing governmental marketing associations;
- studies of meat export possibilities; and
- studies of the need for commercial infrastructure such as markets, receiving stations, marketing information services and slaughterhouses (SDP 1978: 25-27).



The term "studies" appears in several of the priority attention areas -- natural resources and range management, manpower, meat export possibilities -- yet it is not clear, despite their membership in the Club du Sahel and therefore their subscription to the above statement, that the Sahelian states respond favorably to research in advance of action. On the contrary, there is an increasing momentum to go ahead with projects that are less well rehearsed and less well grounded in solid understandings of the ecological and sociocultural realities called for in document after document.

The Club strategy focuses on the expansion of animal production in higher rainfall zones. The reason for this is straightforward: the fear that increases in production in the Sahelian zone per se will require again building up the numbers of animals on the semi-arid pasture, with the attendant environmental risk that has been referred to in any number of papers:

The livestock team hopes, in the future, to be able to assist in the creation of better organized production systems which aim at limiting animal numbers in those zones which risk environmental degradation, at increasing productivity in the higher potential zones, in encouraging the movement of animals into the agricultural zones through integrated production systems, and finally to livestock to the growing consumption markets (Club du Sahel 1978:4, translation MMH).

Sounding a basically pessimistic note, the 1978 Club du Sahel Livestock Paper feels that in fact there is little possibility of increasing production in the low rainfall areas. The essential task, they see, is to protect the range from any further degradation, given the climatic uncertainties of the zone (Ibid.:7). These lands are to be protected by constraining access to specific individuals and groups who will accept the responsibility for their rational use. In other words, if the underlying cause of desertification in the Sahel has been communal access to the range, militating against a conservationist relationship between man and the environment, that communal access

must be terminated, and legally established rights of tenure be accorded to those who agree to maintain the range.

Ainsi le premier problème à résoudre consiste à établir les droits fonciers constituant la base légale pour la protection de ces droits d'usage, et les moyens de les faire appliquer. De nombreux projets ont été considérés comme une première génération de projets sylvo-pastoraux. Ces actions doivent conduire - développer un système de coopération entre les producteurs, qui avec la participation des autorités locales et nationales, devrait conduire à l'établissement de ces droits d'usage spécifiques. Ceci devrait en outre être complété par des lois donnant un status légal à ces droits et par la mise en oeuvre par les gouvernements des moyens et mesures propres à faire respecter ces droits. Les projets en cours, exécutés avec l'assistance de différents donateurs, sont regardés comme un laboratoire où peuvent être essayées différentes méthodes d'approche pour développer l'intérêt des producteurs concernés vis à vis d'une exploitation rationnelle et limitées des terres, ceci par une garantie de leurs droits d'usage (Ibid.:7-8).

Some suggest that reducing the charge on the Sahel while at the same time increasing overall pastoral productivity requires either increasing the weight (and quality) of animals maintained on the range or shifting stock to other areas. The former may be illusory, as increased weight per head demands increased maintenance. The Club has therefore opted for the latter. This strategy, which has become known as "zonal stratification", envisages the removal of young male stock from the Sahel for feeding and fattening in areas of "higher potential", ultimately for shipment to the urban domestic and export consumption centers.

Most previous analyses of the appropriate strategy for livestock development in West Africa endorse in principle the concept of stratification of the production process into three distinct stages or layers:

Primary Producers. Units with cow/calf herds, selling "immature" stock rather than range mature animals.

Intermediate Stage Producers. Units growing out "immatures" to larger sizes suitable for slaughter or for fattening.

Fattening Units. Units fattening grown out or thin range animals before slaughter (D.S. Ferguson 1977:50).

In the French literature the Sahel is known as the "zone naisseur," or "breeding area," the intermediate rainfall region is the "zone engraisseur" or "fattening area," and the high income cities are the "zone consommateur," or "eating area".

Assuming it all works technically, what incentives are presented to the herdsmen to have them reverse their customary behavior and increase the presentation of young stock for sale out of the region? In the past, a major explanation for the failure of highly capitalized ventures, such as abbatoirs, was the inability to maintain a sufficient supply of young males. "There are literally dozens of production zone abbatoirs in sub-Saharan Africa which have either been abandoned or operate only at a fraction of design capacity" (Ibid.:59). Similarly, feedlots established in association with agro-industrial by-products have not been able to work anywhere near capacity, and consequently their operating costs have not benefited from economies of scale. The Club recognizes that current incentives to sell off young stock are unattractive for the herdsmen:

...la valeur relative des jeunes animaux doit être sérieusement augmentée de façon à inciter les éleveurs du Sahel à vendre ou à retirer des parcours sahéliens ces animaux, afin que puisse se développer réellement la fonction de "re-élevage" (Club, op. cit.:17).

I shall defer until considering herder decision-making discussing why offtake is kept low and why male stock are kept for what appears an unduly long period of time. It is worthwhile to point out here, however, the implicit rejection by the Club of the notion that African pastoralists are irrationally motivated by desires for prestige and therefore exhibit "backward bending" supply curves. If the price is high enough, the Club is stating, then the herders will present their animals for early sale.

That raises another question. Where is the additional money to come from?

It is not likely that the added cost can be passed on to the ultimate consumer.

most of

In the producer countries the political decision has been made to keep the price of internally produced foodstuffs, both cereals and meat, at a low level as a subsidy to the urban, and particularly civil servant, sector of the population. Any substantial increase in these costs has been seen as a political risk which the states are unwilling to take. In the coastal cities, the great consumption centers of Abidjan and Lagos (and to a lesser extent Dakar, Accra, and others), Sahelian beef has already faced competition from the World Market. During the later drought years, several Sahelian states closed their borders to animal exports, ostensibly to facilitate more rapid herd regrowth, but in fact to limit the rapidly rising meat prices in the capital cities which threatened political unrest among the urban populations. As supplies declined in the early 1970s, and prices rose, coastal consumption centers, such as Abidjan, began to obtain meat from major commercial exporters, like Argentina. The rise of Nigeria as an important importing nation also put pressure on what Sahelian beef did enter the interstate market, further pushing up final prices. Ivory Coast, for example, experienced a fifty percent reduction in Sahelian livestock: 224,000 head were recorded as imported in 1973 against only 112,000 in 1976. The difference was made up by frozen beef imports from South America, Europe, and elsewhere. With the establishment of this trade now on a firm and large basis, the Sahelian countries are linked with the world beef market, and their prices must reflect or stay within the limits of the commercial exporters' ability to deliver frozen meat. There is thus a clear upper limit that can be charged for Sahelian meat (Staatz 1978:1) for the grades in which it competes.

This point seems to have been inadequately accounted for in the various

strategies and development papers I have seen, which assume an insatiable capacity of the coastal countries to consume Sahelian meat at whatever price. Where economies must be made, in order to keep the price of meat competitive, it is unrealistic to assume that these economies will not be taken from the politically most marginal groups within the producing countries: the pastoral herdsmen. With the exception of Mauritania in the Sahel and Somalia in East Africa, the ruling elites of these states are drawn from groups which are not only not pastoral but which have historically viewed pastoral peoples with ambivalence at best, and often outright hostility.

In the intermediate rainfall zone, the Club envisages a series of parallel and complementary actions. Some of these harken back to earlier attempts at feedlots and growing out ranches, basically highly capitalized commercial operations. These have not had a good track record in the past, partially because of the inability to maintain a steady supply of input stock, and partially because the costs in money and managerial talent were greater than the achieved benefits. The more interesting alternatives are the attempts at intensifying the association of agriculture and livestock, through small scale fattening ("embouche bovine and ovine") by itself or in combination with animal traction.

According to the Club paper on the topic:

Traditionally crop farmers own a few head of animals, poultry and in general sheep and goats, sometimes a few cows that live off the family's garbage and a bit of fodder. The manure produced by these animals, after it dries, is carefully collected and used in the fields around the compound where the most sensitive crops are grown. Groundnut and bean chaff and a small amount of cereal straw are often used as animal feed.

Some crop farmers entrust their cattle to herders whose animals manure the fields and, in exchange, graze the stubble.

In more intensively cultivated areas, this rather rudimentary type of association is replaced by a more integrated system in which the animal, usually cattle, is used for traction. During the agricultural campaign the farmers have to supply feed concentrates (bran, grain) as a supplement for forage in

order to bring out the animal's full work capacity. This makes the farmers aware of the animal's nutritional needs.

When the natural, bush and fallow fodder become insufficient, the farmer decides to harvest and conserve the natural fodder as well as hay and straw for the dry season. The effectiveness of this system is often inhibited by the labor constraint during this peak period of agricultural activity.

The last phase in integrating agriculture and livestock production is characterized by the introduction of fodder crops in the crop rotation cycle, especially the introduction of legumes which, together with the manure that has been spread on the fields, improves soil fertility. This makes it possible to progress on to the intensive cultivation phase, a phase without natural or cropped fallow which is beneficial to the soil. Thanks to this system the working calendar is lengthened thus releasing dry season labor for work on marketable crops. The income, more regularly generated, is used to increase the well-being of the family and, more particularly, to pay for mechanical grain grinding and milling.

Since animal production development in the Sahelian countries favors long-term options, this integration should grow stronger and the animal output from this type of crop-stock association should become increasingly important.

The further need to cope with people's increased demands for staple produce will also give rise to steady intensification of agricultural production which cannot be obtained, assuming that chemical fertilizers are to be used in limited quantities, unless there is some type of partnership with livestock production which, consequently, becomes an essential part of agricultural development (Club du Sahel, "The Association of Agriculture and Livestock," 1977:1-2).

The Club notes that there are a number of technical problems to be overcome. One of the obvious problems is that where the land shows greater productive potential because of more better and more regular precipitation, there also tend to be the glossinae, vectors for trypanosomiasis. The trypanotolerant breeds (like Ndama) are too small effectively to be used for traction, <sup>on densely compacted soils</sup> and in any case, do not contribute to solving Sahelian over-grazing, where the cattle are Zebu, and highly susceptible to trypanosomiasis when moved to the higher rainfall zones. Three actions are therefore invoked by the Club: (1) genetic improvements, such as trypanotolerant breeds which can nonetheless endure the rigors of the Sahel and have the strength to pull a plough; (2) the introduction of disease resistant buffaloes; and (3) clearing land of disease-bearing vectors

particularly the trypano-carrying Glossinae and the onchocerciasis-carrying Simulidae.

For this latter action there is a good deal of controversy. While the affected states and most of the donors seem enthusiastically to have embraced disease-control programs, there have been questions about the costs of maintaining prophylaxis, the ethics of allowing persons to move into areas which cannot be guaranteed to be disease-free (as in some of the river valleys sprayed against black flies), and the ecological consequences of the insecticides themselves. One British parasitologist signals the potential danger in opening new lands for animal use before appropriate management techniques have been elaborated (Ormerod 1977:12-13). (Similar points relating to the settlement of infected river valleys which have undergone spraying of black flies have been made by Brokensha et al 1977:141-157.)

AID has been active in the environmentally-sound use of sterile males. Developed at the Tanga project in Tanzania, the technique is to be extended to Somalia, in a region in which the isolated nature of the infested area facilitates the eradication and subsequent prophylaxis of the flies. According to Nels Konnerup (personal communication), Somali herdsmen are capable of installing and policing their own range management, such that the cleared lands will not suffer from overgrazing which has plagued other grasslands in that country. Not all scientists share this optimistic assessment.

#### B. A Classification of Interventions.

At different times and in different African countries, each of the major donors (IBRD, FED, FAC, AID, UNDP/FAO) has been active in the livestock sector, and literally scores of projects have been proposed and to some degree or another implemented. The interventions group themselves, not too neatly,

into three major categories which, for West Africa, are pretty much in chronological sequence. East Africa, given both the British experience in range management in Canada, Australia, New Zealand and elsewhere, and the early development of a commercial beef industry, followed a somewhat different pattern, in which ranching was stressed from the beginning. Since we are largely containing our discussion to the seven countries specified, we shall not examine the history of livestock developments in Kenya, Tanzania, and other Eastern and Southern African countries.

1. The first set of interventions were those designed to improve the livestock infrastructure, without fundamentally modifying the adaptive behaviors of pastoral herdsman. Among the activities which were essayed are:

a. Improvement of the Livestock Services.<sup>4</sup> Given the French orientation of the Sahelian and Entente States, the Livestock Service was early equated with veterinary medicine. The emphasis was on animal health, and included:

(1) Personnel training - establishing veterinary programs in country, and sending persons for advanced training overseas;

(2) Creation of a network of veterinary health stations, carrying out vaccinations, certifying the health of animals which were to be slaughtered for local markets;

(3) Research programs, particularly genetic research, to produce trypanotolerant cattle;

(4) Vaccine production and disease control and eradication especially the multistate massive rinderpest campaign in the 1960s.

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<sup>4</sup> The classic study which emerged from early attempts at animal health actions in West Africa is G. Doutressoulle (1947). DVM, Doutressoulle was chief of livestock services for the French Sudan.



b. Well-digging and maintenance, including diesel-powered and artesian bore holes to extend the transhumant orbits into regions of good pasture but of uncertain or unavailable, under traditional methods of extraction, water supplies.

c. Development of fire breaks in the rangelands.

d. Improvement of existing market routes and establishment of new ones with wells, veterinary stations, salt licks, creameries.

While there were a number of technical problems -- for example, providing appropriate devices to guard against wells silting up, or refrigeration for vaccines -- the major issues faced by these programs were institutional: how to deliver inputs in timely ways that would maximally advantage the herders. When it was discovered that the tax collector accompanying the vaccinator led to underutilization of veterinary health services, governments were prevailed upon to separate them. The general attitude -- with some exceptions -- respected traditional practice. There was little awareness or concern for environmental issues (a prominent exception being Jean-Paul Harroy, Afrique, Terre Qui Meurt: La Dégradation des Sols Africains sous l'Influence de la Colonisation. Bruxelles: Marcel Hayez, 2nd ed., 1949). There were dysfunctional consequences of some of these programs, especially the tragedy of the Sahelian bore holes, but their intent was to build upon or to, rather than change, customary behavior.

Examples of actions which aimed to build to existing practice are the World Bank livestock projects in Chad and Mauritania, appraised in 1971, and discussed elsewhere in this report. A Bank officer described the Mauritania project as a failure because the additional water supplies -- dug wells, not bore holes -- appeared to result in range degradation. Flying over the area a few years after the wells were put into operation, he noted vast denuded

spaces which he attributed to overgrazing. His pilot assured him that in the 1960s, before the wells had been dug, this region had been in lush vegetation. Therefore, he concluded that such projects which do not control the movements of herdsmen and their animals but permit them to make their own decisions on range use, are inherently destructive. However, the 1960s had been preceded by twenty years of exceptionally high rainfall in Mauritania, with a retreat of the 100mm isohyet 650km northward. The return of normal arid conditions and then the drought may have been sufficient in itself to account for the changes noted. Faulting traditional practice provides a ready explanation, but not, as we shall see below, necessarily a correct one.

2. The second group of actions, typologically and though chronologically not in Eastern or Southern Africa, were those which seek to replicate Western commercial livestock productions systems. The characteristic form of herding in the West is ranching, in which public, parastatal, or private cooperations run animals behind fences. These were early installed in Africa, from Madagascar to Zambia, Zaire, Niger, Nigeria, Uganda, Tanzania, Upper Volta, Congo, and elsewhere. As recently as 1974, such projects were appraised by a major multilateral donor:

The objective would be to create the beginnings of a modern cattle industry. A newly formed company would take over two existing ranches and a maize farm which it would expand and develop into three commercial/breeding fattening ranches... The new company would build up herds totalling some 14,000 head on about 75,000 acres, of which about 4,700 acres would be cultivated with maize and high yielding fodder crops.

The project is clearly discrepant with traditional practice both in the containment of the animals and in the production of special fodder crops on lands otherwise suited for agriculture. It is useful to note that, almost without exception, African cattle do not compete with human beings for food. On the

contrary, in Africa cattle graze lands which are uncultivable under available technology. As large-scale commercial operations these ranches would seem to have little direct impact on the poor, unless they were being deprived of lands. Given the high cost of operation, compounded by the inefficient conversion of cultivated crops into beef, it is hardly likely that the product would be available to the poor at a price they could afford. Since the emergence of "equity" as a concern, justifications for commercial ranches refer to vague benefits which might someday accrue to traditional herdsman and small farmers, but the projects per se do not identify these benefits as measureable outcomes of the intervention. For example, a proposed ranch to be financed by the same multilateral donor in an equatorial African country interests itself in someday expanding production among small farmers,<sup>5</sup> and sees the experiences learned from the ranch and the production of surplus heifers as possible benefits to them. Nothing in the appraisal, however, tells how that expansion might occur. The goals of the projects are to increase meat production in order (a) to increase exports and/or reduce foreign currency expenditures for imports, and (b) to provide local beef for the urban, largely civil servant population. The beneficiaries are then government, urban consumers who have enhanced access to beef at a low or subsidized cost, exporters, and the managerial staff of the project itself. There is little if anything here for low income populations.

Almost without exception these ranches, in West Africa, have been financial catastrophes, achieving nowhere near the rates of return anticipated from the initial cost/benefit analyses. Managerial costs are too high, and the prices received from production -- which cannot exceed world market prices for beef without heavy subsidies -- are too low. Production itself often falls

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<sup>5</sup> "...the long-term objective should be to encourage and assist small farmers to engage in this form of production."

far below expected levels. The following assessment of a ranch program was made by a multilateral agency:

S. is a state enterprise created to operate the two ranches... Within a few years, inexperience, poor management, and lack of technical assistance combines with overstaffing at headquarters in [capital,] and on the ranches led to serious financial and cash flow problems. By 1969, equipment and on-ranch infrastructure, except buildings, were generally out of commission; erosion was taking place on more than 20 percent of the pasture in the well stock M. Ranch; and cattle numbers were no longer known to the nearest thousand<sup>6</sup>... The most important measure to be taken is reorganization to provide an active responsive board, to reduce overstaffing and to plan financial recovery. However, such a step has difficult political implications (1973. emphasis added).

This assessment was made within a proposal to refinance and expand these same operations.

AID's Mali Livestock I left animal breeding in the hands of traditional Sahelian producers, recognizing that animal production projects which include a breeding component have rarely been successful. The project proposed to remove large numbers of immature males from the herds for feeding and finishing at stations of the kind characteristic of developed beef-production economies. These feedlots are associated with industrial crop residues, such as groundnut cakes, cotton seeds, and brewery dross. The projects have potential equity problems, even where they do not *compel* herdsmen to sell young stock at disadvantageous prices. By supplying cheap credit to associations of cattle buyers, there is the risk of creating monopsonist purchasing cartels, which will further weaken the producers' ability to influence price. If a case could be made that these feedlots were economically sound, that there was a sufficient input of young stock to maintain efficient operations, and there were sufficient supplies of reasonably priced crop residues, it would be an

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<sup>6</sup> The total cattle population in the country was estimated at 33,000, up from 300 in 1947.

instructive and equity-based experiment to involve herdsmen in their ownership and operation, as shareholders whose profit would come from the value added to young stock subsequent to their fattening. Assuring an adequate input of young males is problematic, however, as I shall demonstrate below in discussing off-take rates.

3. The third group of actions are those which propose innovations in organizational systems. This currently popular approach to intervention in the livestock sector shares with the first type working directly with pastoral herdsmen and small farmers, and with the second type the introduction of technological "solutions" derived from the commercial sector in developed countries. The major component of these programs in Mali, both the AID and the IBRD projects, and IBRD projects in Kenya, Northern Nigeria, Upper Volta, and Senegal is a range management which is abruptly discrepant with traditional practice. Specific pieces of the landscape are allocated to specific individuals and/or groups. The power of the state is invoked to prevent incursions on the land from persons and animals not included in the scheme, and to control the movements and numbers of animals of those who are. In other words, in order to participate -- and this participation is not invariably voluntary -- the herder gives up control over his major adaptive strategy: mobility. He also gives up the right to decide how many animals he will maintain and how many he will cull at any given time. In return for these constraints, the herders are supposed to receive improved pasture (as a consequence of reduced charge, rotation, and, in some projects, planting of nutritious fodder), veterinary services, wells, credit, rationalized slaughter, market services, and such intangibles as functional literacy. Previous experience with similar projects in East Africa leads one to doubt that herdsmen will enthusiastically delegate

authority over herd movements and structures to persons not directly responsible for the animals.

An interesting variant of these projects has been appraised by the World Bank for Chad and Niger, by defining "pastoral units based on traditional land use patterns" and by formally recognizing "associations of pastoralists based on traditional social groups". The key word in both phrases is traditional. Rather than attempting to impose some organization alien to existing pastoral practice, these projects attempt to identify groupings which have shown themselves, by their durability, to be well-adapted to the exigencies of the physical and socio-political environment. The approach thus seeks to build on existing strengths and capacities of local populations, and to disrupt as little as possible those social arrangements which give substance and meaning to pastoral life. They look to a far more intensive local participation in project execution than has been customary in West African development efforts in general and in livestock sector actions in particular.

The delimitation of useful pastoral units and the formation of effective pastoral associations depend upon two factors, whose presence is not invariable and must, therefore, be established in advance:

- the relatively unique exploitation of a large geographically-delimitable territory by a specific social group;
- an authority structure which, at least potentially, centralizes managerial decisions relating to access to grazing lands and water, and therefore to herd size, composition, and movements.

Where these factors are present, the probability of successful introduction of pastoral units and associations is high; where they are not present, these units and associations would not emerge from the traditional social and ecological organizations of the people. In the case of Chad project, the social analyst decided that the factors were indeed present; in the case of Niger,

the social analyst determined that they were not present throughout much of the proposed project area and only incipiently present in other parts.

What this indicates is that despite a common set of ecological and ethological problems faced by pastoral herdsman in semi-arid rangelands, one cannot a priori impose solutions, even those which seem to have a reasonable track record, without assessing their suitability in the specific local conditions involved.

## II

## The African Herdsman: a Portrait Derived from Development Documents

...de nombreux exégètes de la grande sécheresse s'attachent encore à quelques caractéristiques écologiques du Sahel, hors de toute référence au système socio-économique mis en place dans ce milieu sahélien. Cette approche conduit souvent à privilégier dans l'environnement l'aspect contraintes -- renforcé par la difficulté d'établir une prévision sérieuse des cycles d'aridité du milieu -- et à envisager le futur du Sahel principalement sous l'angle d'améliorations du cadre naturel. Quand une allusion est faite aux processus sociaux dans ces écrits, c'est pour accuser "l'homme": agent de la dégradation du milieu, animal nuisible qui a demandé à cette zone marginalement utile qu'est le Sahel plus qu'elle ne peut fournir, qui n'a pu tenir compte assez amplement de la spécificité du milieu. La grande sécheresse serait donc la conséquence d'un mauvais "managment" de ressources naturelles limitées en quantité et en qualité (Sall 1978:161).

The image which follows is a composite, much like a police artist's reconstruction of the face of an alleged criminal from descriptions by witnesses. It is not necessarily maintained in its entirety by anyone, although it is a reasonably accurate rendering of testimony, if not of facts. I have documented a number of the points with selected quotations from the literature.

The goal of the traditional pastoral enterprise in Africa is to increase without limit the number of animals a person owns. This goal is not part of an investment strategy, to convert the income or increase of the herd into other values, but is maintained for reasons of prestige: the more animals a man can boast about, the more important he is.<sup>7</sup>

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<sup>7</sup> The herdsman "lives outside or on the fringes of a monetary economy and usually he attaches greater importance to the number of his stock than to their productive efficiency" (Nestel et al, 1973:14).



The proof is that herders respond negatively to the market, exhibiting a "backward bending" supply curve.<sup>8</sup> As prices rise they offer fewer animals for sale; the minimum necessary to meet income targets. Since African stockmen regularly retain post-adolescent male animals beyond the reproductive needs of the herd,<sup>9</sup> including both bulls and steers, it is clear that no rational purpose is served. Herds function not as capital but as symbols of status. Given this inherently irrational motivation to increase the numbers of animals owned, herds expand very rapidly, and that expansion has been recently facilitated by interventions such as deep wells and, especially, mass vaccination against epizootics.<sup>10</sup> The result has been a growth of herds beyond the carrying capacity of the fragile semi-arid environment.

This situation would be bad enough if individual herd owners had some responsibility for the condition of the pasture, but it is in fact further aggravated by their rapacious consumption of open land. While animals are

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<sup>8</sup> "Kel Adrar herding strategy is dominated...by the fact that animals are mainly a capital stock, by the backward-bending supply curve in livestock arising from the fact that the Kel Adrar sell to raise a fixed target income..." (Swift 1975:451). Swift is not accusing the Tuareg of irrationality.

<sup>9</sup> "Presently the Sahelian cattle population of about 11 million head has an annual offtake of about 1.1 million head. Given improved marketing and a willingness of pastoralists to sell, there could be an immediate offtake of an additional about 0.2 million head, which are presently retained as a security stock against drought risks because of their high survival rate. Males over two years still make up 6% to 21% of pastoral herds although only 5% or so would be required for reproductive purposes. The balance could be made available for slaughter, grass or feedlot fattening in higher potential areas, or ox-drawn cultivation". (IBRD 1976? Annex 2:9-10).

<sup>10</sup> "...the last drought had much more marked effects than the preceding ones. In the event various factors allied to worsen its impact. The first of these factors was an excessive growth of livestock numbers during the 15 to 20 years prior to the drought, due to the health measures adopted by the animal-husbandry services and to the creation of many new water points. For the period

individually owned, the range is public, free, and as any other free gift treated as if it had no value. The short-run rational strategy is to benefit as much as possible from the pasture before someone else does. The costs of the degradation which inevitably follow are shared by all users: the benefits, however, accrue to the individual herd owner. This is known as the "tragedy of the commons".<sup>11</sup>

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(Cont.)

1955-1970 the increase in livestock numbers amount to:

- + 89% in Senegal
- + 125% in Mauritania
- + 62% in Mali.

Much higher figures have been quoted for the Sudan. The damage caused to the grazing areas of this superabundance of livestock clearly aggravated the effects of the shortage due to the drought" ("Sahel green belt transnational project," UN Conference on Desertification, Paper No. A/CONF.74.29, 1977, page. 5).

"...there are presently far more numbers of humans and livestock in the region compared with two decades ago" ("Report of the first meeting of the Panel on Management of Livestock and Rangelands to Combat Desertification in the Sudano-Sahelian Regions (SOLAR 1976:3).

"In the period 1950-1968 which preceded the drought, livestock numbers increased rapidly (3-5% per year). This unprecedented growth was made possible by an extended period of favorable rainfall, the control of the major communicable diseases through donor-supported vaccination campaigns and the development of additional permanent water resources. By the mid-1960s, the numbers of livestock exceeded dangerously the medium to long-term carrying capacity of the communal rangelands" (SDP 1978:18).

For a measurement of livestock increase in the Sudan, see Wilson (1977).

<sup>11</sup> "Large numbers of cattle must gather in the few rich dry season grazing areas or migrate from the zone, generally toward interior urban and coastal markets. The cry from all quarters is to improve range management, but no formula has been suggested which is compatible with uncontrolled grazing land. Each pastoralist desires to increase the number of cattle in his herd; each burns the dry grass as he passes through dry season grazing lands. Striving to maximize their personal benefits, the pastoralists collectively drive the rangeland to a marginal level of return" (Helman 1972:5).

"It has often been said that the Sahelian pastoralist has a deep-rooted tendency to increase the size of his herd far beyond the carrying capacity of the grazing lands, so as to set up some kind of insurance against livestock losses caused by drought years, or even just to enhance his prestige. This attitude, which is incorrect from the standpoint of modern zootechnics and economics, is however logical from the individual pastoralist's point of view since everybody has unrestricted access to the community's grazing land, which means that if he had half as many beasts, they would not be better fed, and he would be half as rich" ("Sahel greenbelt transnational project," op. cit.:13).

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Once the herder derives all possible benefit from a particular pasture he abandons it and moves on in a race against others to find new lands for his animals. Being nomadic, without fixed residence, the herder has no loyalty to place. Moving swiftly across the bush, sometimes swarming as locusts, his animals consuming everything in sight and leaving barren ground in their tracks, the pastoralist avoids not only the tax collector but also the medical officer, the veterinarian, and the school teacher. The requirements of mobility preclude his accumulation of useful material goods. Thus, unschooled, in ill health, without the implements of modern life, his existence is miserable.<sup>12</sup>

Herd expansion, open access to range, and nomadism in a fragile ecosystem such as the Sahel are the prime causes of desertification,<sup>13</sup> the permanent decline in the capacity of the environment to produce useful crops. As the animal charge increases, and the land is over-grazed -- land which does not belong to the herder and therefore in which he has no conservationist interest<sup>14</sup>

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<sup>12</sup> "About 10 million West African pastoral people, of a total population of 140 million, depend primarily on livestock. Although pastoralist's incomes are generally higher than the majority of crop farmers, their quality of life is deplorable".

<sup>13</sup> "...the most urgent problem in the Sahelian zone is that of desertification caused chiefly by overstocking resulting in overgrazing of rangelands" (SOLAR 1976:1).

<sup>14</sup> "A conservation ethic oriented toward the long-term preservation of the ecological resource does not exist among the pastoral cultures of the Sahel. An analysis of why conservation has not developed as a cultural value reveals that the benefits of conservation are delayed and tend to be shared. Thus, an individual herdsman realizes only a fraction of the rewards of his efforts, which he then discounts heavily. His benefits are shared because, since property is held in common, he cannot prevent others from grazing on pastures for which he has limited his own herds. The limitation of his own herds is an immediate cost which he alone bears. Thus, conservation has always been negatively reinforced by the same social and environmental system that positively reinforces herd maximization behavior (Picardi 1977:164-165).

-- palatable species give way to less palatable species, perennial grasses are replaced by annuals, soil is lost through wind erosion, and the ever increasing numbers of animals are compacted in ever decreasingly productive land.<sup>15</sup> From time to time, the system erupts with a drought which, for a brief period, reduces the charge and gives the land a breathing space. But the incessant desire to increase the herds rapidly again exceeds tolerable maxima, and the process begins anew. To make matters worse, in the false belief that such action encourages the emergence of fresh grass, herdsmen set fire to the range. Yet fire is destructive, reducing graze, sterilizing the soil and killing nitrogen fixing bacteria, driving out moisture, and contributing to drought.

It seems incredible that people practicing so self-destructive an economy could have survived. Yet they are wedded to behavior hundreds<sup>16</sup> if not thousands of years old, hewing to ancestral traditions which are, to the sympathetic but objective observer, so dysfunctional to themselves, to their habitat, and to the national states in which they are subjects, malgré eux-mêmes.

Given this Hobbesian portrait of a population so overwhelmed by their individual drives to maximize wealth and standing at the expense of the

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<sup>15</sup> "Overstocking of grazing lands resulting from an undue increase in livestock numbers due to favorable circumstances brings about the gradual disappearance of the herbaceous cover and deterioration of the soil through trampling. Perennial grasses disappear, giving way to annual grasses of lower pastoral value. These may in turn be eliminated by severe overgrazing, the result being the dominance of very short-cycle species, e.g., of Leguminosae, which even under continuous grazing can manage to flower and seed" (SOLAR 1976:6).

<sup>16</sup> "The centuries old pattern of raising cattle has essentially been unaffected by donor investments and by the policies of and services provided by West African states" (Helman, 1972:1).

The "nomadic Tuareg herdsmen may be forced to abandon their time-honored customs if the sahel is to continue to maintain them" (Picardi & Seifert 1976:9, emphasis added).

community, the environment, and the state, one hears two contrasting voices as to the appropriate donor response. A minority voice suggests leaving these archaic peoples and their marginal environment alone: triage. Among donors this view point appears among those who argue that investments should be made only in the higher rainfall areas where there is a greater likelihood of an economic return. The others, seemingly in the majority, argue that we cannot afford the luxury of triage, if that will mean permanent abandonment of the semi-arid range. For these marginal lands, it is argued, are capable under proper management, of sustaining a reasonable level of animal production, a resource in great demand by the important urban-based populations in both producing and neighboring importing countries. With what appears to be a growing market for red meat and a paucity of alternative exploitable resources, it is little wonder that poor countries in semi-arid Africa show great interest in increased production and exportation of animal productions, and it is natural that the donors should respond sympathetically to requests for financial and technical assistance in the livestock sector. Thus, predicated on the portrait of the herding enterprise sketched out above, and on the desire to assist these poor countries, a development posture has been elaborated which is supposed to (a) increase production of meat, particularly beef, for both internal and export markets (satisfying domestic political demands while earning balance-of-trade improving revenues); (b) retard or even reverse environmental degradation and desertification; and, in the long run, (c) improve the income and well-being of pastoral producers.

But the portrait, however persuasive it might appear because of its internal logical consistency and its seeming ability to account for much of what is known, is flawed. Rather than describing the pastoral enterprise, the portrait caricatures it, substituting untested assumption for verifiable

hypothesis, rhetoric for analysis, imposing ethnocentric models which project motivations drawn from quite alien environments. Ignoring or misunderstanding much of the available body of knowledge about African pastoralism, it serves to justify a development posture which, historically, has had an exceptionally poor track record, and which has had disastrous albeit unintended consequences.<sup>17</sup>

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<sup>17</sup> "Large-scale ranching enterprises (Doli/Senegal; Ekrafane/Niger; Ouaddi Rime/Chad) have been tried in the Sahel but proved to be uneconomical. Commercial feedlots based on irrigated fodder production or agroindustrial by-products for fattening Sahelian feeder steers have not yet proved their economic viability, and have yet to assure a constant flow of feeder cattle... Grazing control programs with pastoralists were first attempted by USAID in Northern Nigeria, and have been a failure".

"Pastoral research and development in the Sahel have not achieved the results hoped for. There are reasons for these failures. Development schemes have often ignored traditional grazing practices, resulting in severe deterioration around newly created watering points... Perhaps most important, however, is the fact that insufficient attention and importance have been given to the socio-economic and ethno-cultural context of local populations. These populations have an intimate knowledge of the environment and a wealth of experience... Given the need in any successful developmental action for active participation of local populations (thus excluding the imposition of ill-adapted exterior models) and given the disorganization of the pastoral system after a period of drought, it is recommended that:

- all research and developmental operations take into account the socio-economic context of local populations;
- the 'ecological' and zootechnical experience and knowledge of the local populations be considered the point of departure for studies which precede and prepare development projects;
- all research and development actions be accompanied by educational action so that local populations recognize their responsibilities in the use and exploitation of their environment;
- in the context of the current drought, a detailed evaluation of the real potentialities of the Sahelian zone be undertaken, as well as an examination of the behavior of local populations during the period prior to the present situation" ("Sahel greenbelt transnational project," *op. cit.*:22).

## III

Commissions, Omissions, and Assumptions  
in  
Livestock Development Strategies, Programs, and Projects:  
a Critical Examination.

## A. What about desertification?

At this point we want to examine the assumption that the semi-arid environment is subject to secular degradation, the permanent decline in its ability to produce useful crops, and the further assumption that the pastoralists, through loading the range with more animals than can be comfortably sustained over time, bear the prime responsibility for such degradation as does occur. So many documents, officials, and even scientists repeat the assertion of pastoral responsibility for environmental degradation that the accusation has achieved the status of a fundamental truth, so self-evident a case that marshalling evidence in its behalf is superfluous if not in fact absurd, like trying to satisfy a skeptic that the earth is round or the sun rises in the East.

It is generally agreed that overstocking and the lack of managed grazing patterns in the Sahel are the most important causes of desertification in the Region and that desertification is a symptom of more fundamental problems of rapid population growth and the inability of individuals and communities to adopt known land management and conservation technologies. If current desertification trends cannot be reversed quickly, the countries of the region may permanently lose the capacity to feed themselves and the ability to support a growing population at even current subsistence levels. For these reasons, the mastering of the critical problems of overstocking is one of the keys to the medium- and long-term economic development of the Sahelian Region (D. S. Ferguson 1977?:7).

This is a powerful accusation, the one most commonly leveled at African pastoralists since the 1968-1974 drought made the planning community aware of environmental and ecological components of development. Since the thrust of the statement leads to programs which alter the traditional system of range

use and lower the stocking rate, actions which are most likely to engender hostility and non-cooperation on the part of the herders, and require non-voluntary of coercive measures to assure their participation, it is important that it be examined carefully. The assumptions must be confronted with a demand for evidence, and we must be satisfied with their logical coherence.

Let us segment the accusation into its component parts:

- (1) The environment is being degraded, desertified.
- (2) Desertification is caused by over-grazing.
- (3) Over-grazing is the result of
  - (a) common access to pasture
  - (b) an unwillingness to limit stock numbers
  - (c) lack of constraints on pastoral mobility.

To A. C. Picardi, a graduate student in chemical engineering who authored the pastoral systems volume in the MIT Framework for Evaluating Long-Term Strategies for the Development of the Sahel-Sudan Region, secular degradation of the Sahel is an established fact.

For the past 50 years, explorers and range ecologists have reported a slow process of desertification in various areas of the Sudan...and North Africa ..., attributable to various factors such as overgrazing or deforestation. Satellite photos of the region from 1972 to 1974 indicate the contrast between protected and non-protected rangeland, where the difference in vegetative cover made by a fence and some simple management policies is clearly visible... These findings correspond with numerous accounts of 'the Sahara creeping south' which begin to appear with every account of the drought-stricken area. Thus, one can gather that desertification existed for a long time (1974:55-57).

Does the "thus" in the last sentence necessarily follow from the preceeding material? The "numerous accounts" may well be instances of Gresham's law applied to journalism: bad news drives out good. Every extended period of deficit rainfall is accompanied by warnings of the advancing desert. In 1935, E. P. Stebbing, forestry professor at Edinburgh, published "The Encroaching Sahara," based on his travels the year before in Niger and Nigeria. He pointed



to vast sterile sandy regions from the Niger River to Lake Chad as evidence of a southward migration of the desert. The Anglo-French mission in 1936-37 sent to examine the area, concluded that Stebbing's judgment was a "pessimistic exaggeration" (Aubreville 1973:5), although they allowed the land was being abused by deforestation, bush fires, and poor use of pasture.

What has been less well publicized is that in average and above average rainfall periods, such as during the ten to twenty years which preceded the 1969 crisis, the desert retreats and in some places spectacularly:

Charles Toupet was able to calculate that in Central Mauritania, between 1941-42 and 1951-52, the 100mm isohyet moved 650 km toward the north... 'The sector thus demarcated between [the two isohyets], which can therefore alternatively be a desert from which the herdsmen flee, or a zone of pasture land attracting the herds, covers 340,000 km<sup>2</sup>, or about 31.5 percent of the total area of Mauritania'... [The period from about 1945 to about 1965 correspondends to a generally wet cycle in the whole of the north sudanese and sahelian zone of West Africa, a wet cycle which is shown by a progression of crops, a projection of pasture land towards the north, and a recession of the Sahara (Bernus and Savonnet 1973:117, emphasis added).

Gresham's law precludes treatises on deserts that fold their tents and creep away.

### (1) Ecology and Desertification

The identification of desertification itself is not simple. Range ecologists and agrostologists argue that to distinguish true desertification from temporary declines in production and temporary changes in species composition due primarily to several years of below average rainfall requires the accumulation of evidence over a long period. "Only over periods greater than a decade can desertification be clearly distinguished from the less lasting effects of drought" (Warren and Maizels 1977:1).

Although the surveys and some of the other observations must undoubtedly be believed in their assessment of great damage, it is a more complex task to determine just how permanent this is. Where, as in the hilly Ethiopian Province of Tigre, there has been extensive and deep gullying,

it cannot be doubted that recovery will be very slow indeed, but the sandy lands of the Sahel may recolonize and recover within a few years... (Ibid.:13, emphasis added).

Over a period of time changes in the composition, mass, and quality of the vegetative cover may occur but it is not inevitable that these changes are, in aggregate, negative. The veterinarian and agrostologist, Jean Valenza, has documented the shifts which occurred in the Senegal Ferlo sylvo-pastoral region in the twenty years since deep water points were introduced, and concludes "les pâturages naturels de type sahélien-sahélosudanien n'ont subi dans leur ensemble que peu de modifications en dehors de celles dues à la pluviométrie" (Valenza 1975:1).

Thus, twenty years after the startup of a pastoral hydraulic program which expands year after year, the natural range of the Senegalese sylvo-pastoral zone and especially the Western or "sandy" Ferlo pasture, seem to have experienced only slight modifications in plant cover; these appear more the result of variations in amount and distribution of rainfall than of the increasing charge in livestock numbers. Only within the several kilometer radius around permanent watering points are the changes noticeable... (Ibid.:5, translation MMH).

Thus, the only substantive changes in the pasture found after twenty years of intensive exploitation which were not caused uniquely by changes in precipitation were those in close proximity to the bore-holes. Valenza rejects the very term "pastoral degradation," preferring to use the less value-loaded term "transformation," recognizing that the impact of the changes could be positive as well as negative. We need not share his optimism that the pasture transformations in association with deep wells have been beneficial to note that changes due to grazing rather than to precipitation are terribly difficult to identify. We have found only one study that establishes a methodology for distinguishing the pasture impacts of Sahelian drought per se from

those associated with drought plus grazing (Breman and Cisse 1977; see also Breman et al 1975). This again was limited to comparing the area in proximity to a single watering point on the Niono Ranch, Mali, with areas 4 km and more distinct.

The difficulty in making unequivocal judgments about the contribution of an activity to environmental degradation may be seen clearly in the case of fire. Many planners and officials would like to ban it altogether and, indeed, governments have initiated stiff penalties for those who burn the bush (although official capacity to enforce the rule is very limited). Yet it is not clear that on balance, the effects of such burning are detrimental to the range. According to the ecologists Warren and Maizels,

A gentle burn every year or two at the start of the dry season removes old stifling growth and allows new green shoots to come up in the following wet season. It releases nutrients held in the old litter that would otherwise only be slowly recycled, and it does not seriously damage the soil humus. Fire discourages scrub and therefore both encourages grass and keeps away pests and diseases such as tsetse and trypanosomiasis; indeed, where there has been a deliberate prevention of burning, there has been such serious encroachment that burning has been re-introduced (Op. cit.:50-51).

Breman, who with his Malian colleagues has followed the transhumance of the JafaraBe FulBe from the Niger Interior Delta to the Mauritanian Sahel and back, states that while fire caused a substantial decrease in dry season biomass, and while we do not know what the long term environmental effect might be, "the direct nutritional benefit for the herd is obvious..."

Without fire the cattle found little digestible food on the vast plains. It consisted mainly of *Vetiveria nigritana* when present as isolated standing green tussocks. These were the only tussocks which had enough green material to allow the cattle to select a diet without too much low quality straw. The regrowth after fire resulted in more available biomass of higher quality... In addition to this regrowth the green tussocks remained available because they were left untouched by the fire due to their green foliage and isolation (Breman, Diallo et al 1978:8).

Breman argues that burning increases available protein from under 5 percent to almost 20 percent, ostensibly compensating for the loss in total graze.

Our point is not to argue that there are no negative consequences of burning the range, but to note how much more must be understood about the process and its effects before we should support the substitution of a judgment other than that of the herders themselves. Clearly, caution is indicated where the necessary data and analyses are so thin.

## (2) Anti-Nomadism

Pastoralists have been viewed with disfavor by governments and development planners for a very long time. Of the multilateral organizations, the FAO had been the most consistent advocate of changing pastoral practice. In 1962 they noted two ways of ameliorating the conditions of arid zone grazing:

The first is to introduce measures of improved management in the semi-arid grazing lands themselves which still make it possible to utilize this resource on the basis of conservation and to produce the livestock products characteristic of the environment. The second is to start actions which will make it possible if not essential for the free-range grazer and their livestock gradually to rely less and less on the semi-arid grazing resource, and to become more sedentary than they were before. This trend is desirable from a social, medical, and educational point of view (FAO 1962:363, emphasis added).

Ten years later, during the Sahelian drought, FAO's accusation was even fiercer:

Quant aux nomades,

ces populations constituent maintenant une lourde charge sociale, économique et politique pour leur pays... Il ne prennent soin de rien, se refusent à tout travail manuel, rechignent à payer l'impôt, se résignent difficilement à vendre leurs bêtes et, de ce fait, ils n'apportent pas à la vie économique des pays toute la contribution qu'ils seraient en droit d'attendre d'eux... Leur alimentation est un luxe et un gaspillage, du fait qu'ils assurent plus de 50% de leurs besoins énergétiques avec des produits animaux. Consommer aujourd'hui plus de fromage et de lait que de céréales est un luxe...et payer les céréales plus cher que la viande qu'ils vendent est un absurdité économique qui les éloigne de toute intégration possible à une économie de marché (FAO 1973:14).

The fact is that the milk and cheese which they consume does not compete, unlike Western dairy produce, for grains, for the cattle graze ranges unsuitable for any other form of production. Far from being wasteful, *pastoral dairying makes productive an environment for which, given presently feasible technologies,*

*there is no other use.* \*

The notion that pastoralists are inherently destructive of the environment finds support, unhappily, even in the writings of some anthropologists (mostly, although not entirely, among those who rely on secondary sources). Arensberg and Lomax add their prestigious voices to this idea:

Most of horticultural Central Africa was shielded by its dense tropical forests, but elsewhere on the continent spearmen of the Nilotic tradition or mounted black Arabs of the Saharan border overcame the horticulturalists. Thus, virtually the whole of Afro-Eurasia has felt the influence of this patrilineal, sexually punishing, male-dominated, warlike, and essentially wasteful cultural tradition. Pastoralists overproduce as a guarantee against famine, and a sign of prosperity and pride, but large herds overgraze, and pastoral overgrazing has created deserts where gardens once were. Just as selective castration is practiced to improve the stock, so ruthless measures -- clitoridectomy, labiodectomy, punishment of feminine incontinence by death -- are taken to insure the legitimacy of patrilineal heirs. Clan loyalties and monotheisms spawn wars. These negative aspects of pastoralism, which infect most civilizations, may be traced back to the rigorous and often cruel system which shapes the characters of the herdboys in these societies (Lomax and Arensberg 1977:676).

Arensberg and Lomax are echoing the writings of George Peter Murdock, who, like they, worked neither in Africa nor with pastoral peoples:

Throughout this early Islamic period the rulers of North Africa, whether Arab or Berber, strove with some success to maintain the economic order and the essentials of the urbane civilization which they had inherited from their Greco-Roman predecessors and which the Moors perpetuated and even elaborated in Spain. In the 11th century, however, their efforts came to nought, and North Africa was plunged suddenly into an era even darker than that which had engulfed Europe. The cause was a mass invasion of Bedouin Nomads from central Arabia, beginning about 1045 and continuing at a decreasing rate for several centuries. These 'Hilalian' invaders -- who numbered, according to various estimates, anywhere from several hundred thousand to several million -- poured into Egypt and spread like a swarm of locusts throughout the former Berber regions of North Africa. Illiterate nomads, intolerant alike of agricultural and urban civilization, they preempted all land suitable for grazing, upsetting everywhere the fine balance which the Berbers had achieved between cultivation and animal husbandry. They converted fertile fields to pastures by destroying or neglecting the waterworks constructed by the labor of centuries. Their flocks devoured the natural cover of vegetation, ultimately ruining the forests that had once supplied timber for the Carthaginian and Roman fleets, and by overgrazing induced erosion which converted even pasture lands to barren semi-desert. Population, of course, withered...(Murdock 1959:393).

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• Over the next two and a half pages, the author allows himself an historical digression dear to the academic heart. Readers who smart at such are warmly invited to skip it and pass directly to section (3), Range Use.

Murdock, of course, is merely repeating the bad press which Ibn Khaldun, the great advocate of urban life, laid on the wandering Bedouin:

It is noteworthy how civilization always collapsed in places where the Arabs took over and conquered, and how such settlements were depopulated and the very earth there turned into something that was no longer earth. The Yemen where the Arabs live is in ruins, except for a few cities. Persian civilization in the Arab Iraq is likewise completely ruined. The same applies to contemporary Syria. When the Banu Hilal and the Banu Sulaym pushed through from their homeland to Ifriqiyah and the Maghrib in the beginning of the 5th (11th AD) century and struggled there for 350 years, they attached themselves to the country, and the flat territory in the Maghrib was completely ruined. Formerly, the whole region between the Sudan and the Mediterranean had been settled. This fact is attested by the relics of civilization there, such as monuments, architectural sculpture, and the visible remains of villages and hamlets (Ibn Khaldun 1967:304-5).

Thus Ibn Khaldun reversed the more favorable reviews shepherds received in the Old Testament:

And Abel was a keeper of sheep, but Cain was a tiller of the ground.  
And in the process of time it came to pass, that Cain brought of the  
fruit of the ground an offering unto the Lord.  
And Abel, he also brought of the firstlings of his flock and of the  
fat thereof.  
And the Lord has respect unto Abel and to his offering; but unto Cain  
and his offering He had not respect (Genesis 4:2-5).  
late 14th Century

Ibn Khaldun's <sup>A</sup>tirade against the Bedouin, his accusation of their destruction of the agricultural basis of North African civilization, has been repeated -- normally without citation -- so often that it now has the status of unimpeachable fact. Yet recent scholarship has reopened the question, and rejects the facile claim that pastoralism is inevitably associated with destructive, militaristic exploitation. J. Poncet (1967) and C. Cahen (1968) insist that Maghrebian civilization was already coming apart before the entry of the Beni Hilal. The politico-economic center had shifted from the Magreb to Egypt, and the former was becoming peripheral and unimportant, with a decline in maintenance of agricultural systems, before the Bedouins, who turn out to be relatively minor players in the piece, appeared on the scene. Talal Asad,

the Saudi Arabian anthropologist to whom we owe a magnificent analysis of the Kababish pastoralists of the Sudan, has also commented on the issue:

Thus the possibility arises of seeing the destruction of irrigation and the simultaneous "beduinization" (pastoralization) of local economies as consequences of historical processes in which the military force used by the beduins is of minor importance. Apart from the collapse of internal military security within the state and of the emergence of autonomous political regions, long-term economic factors may make for a retreat of the agricultural frontier between the desert and the sown. It is worth remembering that prior to the modern era with its unique incentives and pressures (demographic, technological, and economic) for promoting agriculture, marginal cultivated land might be abandoned to pastoralists quite independently of any military threat from the latter -- because of population shortage, the declining value of certain agricultural products, or the desire to escape from an extortionate government (Asad 1973:66).

### (3) Range Use

In most of contemporary Africa, the situation is exactly the reverse of that reported by Ibn Khaldun. Ever since colonization confirmed the dominance of agricultural peoples in all West African countries, with the exception of Mauritania, and in all East African countries with the strong exception of Somalia, herdsmen have had to retreat in the face of expanding agriculturalists. Much of the problem faced by Sahelian pastoralists has been a compression of their range not only by a southward moving desiccation but also by a northward moving cultivation. Traditional range management systems which depended upon near ethnic homogeneity broke down as the migration of farming northward in Niger forced the Fulfulde-speaking Bororo to push into territory previously exploited uniquely by Tuareg. The implantation by governments of deep wells open to all comers was the final insult, leading to chaotic competition for grazing land. The fault lies not with the herders, however, but with the donors, governments, and the farming peoples favored by them.

In the Sudan, pastoral herdsmen, such as the Shukriya, are finding their traditional range eroded by the expansion of irrigated perimeters along the

Blue Nile, the Nahr al-Rahad, and the Nahr al-'Atbara. Some of these herdsmen have become tenants on the scheme, others are maintaining what pastoral existence they can in an arena of contracting resources, while the remainder move back and forth between the two (Sørbo 1977). (Development anthropologist Muneera Salem Murdock is currently investigating the impacts on Shukriya women of the New Halfa and the Kashm al Qirbah schemes, and her work will provide needed insights into what has been the most neglected area of study to date: consequences of technological changes on women.)

The consequences of forced sedentarization, which has not been an active policy in West Africa, have almost without exception been disastrous:

Barth (1962) has described the results of sedentarization in the case of the Basseri tribe of Fars. Here during the reign of Reza Shah a government program to settle the nomads was instituted in the 1920s. Nomadism in Iran was then seen as an obstacle to modernization, a military threat, and therefore politically undesirable. It was argued then that in order to pacify, modernize and educate these people, it is necessary to settle them in village-like schemes. Barth...reports a sheep mortality of 70 to 80 percent when the nomads were settled.../During the period of forced sedentarization/, since pastoralism is the only possible way of life in many districts of Iran where rainfall is inadequate for crop-growing, Iran was deprived of many commodities such as milk, meat, wool, hides and draft animals (Darling and Farvar 1972:678).

Similar effects followed the attempts in the 1920s to sedentarize the Kazakh horse nomads in the Soviet Union and the Bedouin of the Egyptian Western Desert.<sup>18</sup>

In East Africa, managed grazing schemes have been more vigorously pursued than in Francophone West Africa, reflecting the greater British than French experience with range-fed stock. The best known of these schemes have been among the Kamba in Machakos, Kenya, and in Masai country in Kenya and Tanzania. The "sectional grazing schemes," some of which pre-date the Second World War, are remarkably close to the kinds of interventions now underway in the Sahel, under USAID and IBRD sponsorship and funding.

<sup>18</sup> "...government officials concerned with livestock [in Afghanistan] appear to have a rather good understanding of the ecological arguments for continued transhumance or nomadism. Possibly Afghanistan's position as neighbor to the rather disastrous programmes of settling nomads in nearby countries (Iran, USSR) has given its people a keen appreciation of what sedentarisation entails" (Sandford 1977:5).



These schemes /in Kenya/ involved dividing a range area into several grazing blocks, instituting a relatively simple rotation system (based on the traditional movement of Masai livestock between wet-season and dry-season areas), providing water supplies and disease control, and attempting to provide for destocking by creating special markets. Livestock officers administered and supervised each scheme. These officers acted under special ordinances and by-laws, which empowered them to: (1) approve which Masai were allowed to graze..., (2) determine the number of animals each was allowed to graze, and (3) select the area to be grazed.

The first such grazing plan was the Ilkisongo... This scheme, like the others, was a disastrous failure. By 1956 the area was severely overgrazed. In 1959, the destruction was so bad that where the scheme used to be, a jagged, bare, red earth scar in the savanna landscape was visible from a high-flying airliner...(Talbot 1972:705).

In the Sahelian area, although there have been a number of experiments with ranches, in which animals were supposed to be confined within formal boundaries (such as the AID-supported Markoye, in Upper Volta), most of the pre-drought projects were relatively free of any attempt at sedentarizing the herders. <sup>as noted above</sup> In the early 1970s, the World Bank appraised two projects for the northernmost Sahelian countries, Chad and Mauritania. These projects are noteworthy for their acceptance of traditional livestock and land management systems, and for their calm tones in assessing the ecological consequences of open-range grazing. Because the position taken in these papers is so discrepant from what we have heard subsequently, I shall quote from them at length:

The system of nomadic grazing of livestock is not conducive to the introduction of improved methods of animal husbandry, but at present it is the only form of land use for the Sahelian zone which is feasible on a large scale. The northerly movement of cattle to use pastures and water in the drier zones during and immediately after the rainy season reduces grazing pressures on pastures in the southern zones to which cattle return for the dry season. Losses from drought would increase considerably if there were a basic change from nomadic to sedentary grazing...

In many areas in the Sahelian zone of Western Africa where communal grazing is practiced, overgrazing has become a serious problem leading to pasture degradation and soil erosion. Various measures for control of grazing have been attempted by countries in Western Africa but they have met with only a limited degree of success. Fortunately, overgrazing does not appear to be a serious problem in Mauritania at this stage. Studies suggest, in fact, that the available pastures could support more livestock than they do at present.

In any event, it is doubtful whether any systems of grazing control would be acceptable to livestock owners or could be enforced by the Government Services in Mauritania at this stage.

For some years to come, any proposals for developing or assisting the livestock industry will have to be based on the premise that the industry will continue to operate on a system of communal grazing with large scale seasonal movement of the herds. In this situation, feasible actions to assist the livestock sub-sector are virtually limited to those designed to improve the network of wells, to control animal diseases and to protect pastures against fire (IBRD. Mauritania. Appraisal of a Livestock Development Project. 1971, p. 6-7, emphasis added).

In 1971, the World Bank was able to state that the range is fundamentally resistant to long-term degradation from grazing: "The bulk of the pasture comprises annual grasses which have a short vegetative cycle and set seed by September. This type of pasture is not very susceptible to degradation by overgrazing as seeds are always plentiful for regeneration in the following season" (*Ibid.*:3). The grasses set seed just at the end of the rainy season, when pasture is at its most luxuriant. The animals may graze the grass down to the ground as the dry season progresses, but the seeds for next year's growth are already in the soil, awaiting the rains for their germination.

Similarly, the Bank's Chad paper makes no attribution of ecological degradation to the activities of pastoral herdsmen, except where bore holes were introduced, and the excessive volume of water available led to overstocking. Yet even this is not claimed to have caused permanent damage:

Marked changes in the rangelands have been reported from Kanem Prefecture, and the predominance of annual grasses throughout the Sahelian zone is believed to reflect an ecological deterioration from an original community of perennial species. Extensive grass fires and increased cultivation of millet in marginal areas probably have a more drastic effect on soils and vegetation than the present rate of stocking.

The significance of these ecological changes is hard to assess, but there is little evidence of serious bush encroachment and depleted ranges regenerate quickly. Moreover, there is no evidence of significant soil erosion. High rates of water infiltration in the undulating sands and moderate to good grass cover combine to prevent erosion, even during high intensity rain storms.

Since stocking rate tends to be limited by the amount of pasture at the end of the dry season, there is always an abundance of feed after the rains, during which the annual pastures are setting seed. Thus continued seasonal regeneration seems assured and any overgrazing during the latter part of the dry season is unlikely to have permanent detrimental effects (IBRD. Chad. Livestock Development Project. Annex 2, p. 4-5, 1971(?)).

Far from destocking the range, an objective of both the Chad and Mauritania projects was to increase the number of animals and the productivity of the pasture. This increase was to be achieved by opening up new pasture through the provisioning of water, dug wells, in which the water must be drawn by hand. In Chad, each well was to serve an area of about 15,000 hectares, defined by a seven kilometer radius from the well. A carrying capacity of one adult cattle unit and one adult sheep/goat unit per 10 hectares was calculated. Thus, the well area of 15,000 hectares might carry 2,100 cattle and 1,800 sheep/goats.

This is about the number of animals that can be safely maintained without danger of overgrazing.<sup>19</sup> Since the minimum daily water requirement is about 20 liters per adult cattle unit and 5 liters per adult sheep/goat unit, and since traditionally methods of drawing water can only provide a yield of about one liter/second, it follows that this is about the maximum that can be watered from a single well operating approximately 10 hours a day.

To increase productivity, the paper recommends not corraling animals at night.

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<sup>19</sup> Given the agrostologic conclusion previously reached in the IBRD Chad Livestock paper, "overgrazing" would appear here to refer to the inability of the range to provide sufficient food for the animals and not do damage to the environment itself.

As I shall suggest further on, the decision to provide relatively shallow wells whose water must be drawn by hand (or by animal power), rather than engine-driven or artesian bore holes, was environmentally correct. However, it is necessary to go farther than merely providing the wells. If some control of stocking rate in proximity to the watering point is to be achieved, it is also necessary to identify who is entitled to use the water. Sahelian governments have not been willing to take the political risk of restricting access to water when provided with public funds. Thus, traditional land management understandings which were predicated on limited access to water broke down, and animals starved for forage in the midst of adequate water. Where lands are not pastured due to inaccessibility of water under traditional well-drilling techniques, it would be preferable for governments to lend funds to specific groups who would reimburse the state for providing water exclusive to their own use.

It would be presumptuous to assert on the basis of the two Bank project papers for Chad and Mauritania, which were written before the impact of the drought was widely appreciated -- although, in fairness, the Sahelian drought began in 1968-1969, and by 1971-72 many persons working in the region were aware of its presence -- that open range grazing as practiced in the Sahel has more modest negative effects on the environment than would justify the trend to forced sedentarization. Yet there is the beginning of a body of evidence suggesting this position, and that evidence is emerging from agrostologists and rangeland ecologists whose hard-headedness and ruthlessly value-neutral empiricism is hardly open to question.

Peyre de Fabrègues, the I.E.M.V.T. agrostologist, concludes his 1971 study of Sahelian pastures in Niger, by remarking on the resilience of the range:

Changes in pasture produced by dry season grazing only last as long as that grazing continues. Indeed, it has been noted that annual, perennial and native plants have sufficient regenerative power, due to their seeds, to reappear as soon as the range is deserted for at least one year with good rainfall.

- The sometimes more spectacular increase in the relative abundance of annual plants from the first year in the most heavily stocked zones, and later in the burned areas, is a good reflection of what happens in range-lands, but is too diffuse to be easily measured. Nevertheless it is an improvement, taking into account the preference of animals for annual forage plants.

- The influence of rainfall, although of major importance, changes vegetation only momentarily and in a way that can reverse itself.

Finally, from an agrostological point of view, it can be said that the present composition of the plant cover, established on the basis of average observations over several years, corresponds on the whole to a stabilized subclimax. Its forage value is practically identical to that of ungrazed pasture (Peyre de Fabregues 1971, quoted in Bernus 1977:77-78, emphasis added).

We do not know how pastoral systems impact on enduring ecological change in semi-arid range lands, but some geographers suggest that the notion of the Sahelian ecosystem as "fragile" may be overly simplistic, and the term "resilient" is more appropriate (R. Kates, pers. comm.). The stockmen may prove to be less perpetrators of environmental degradation than victims of the joint actions of climate and government. To predicate a development posture on the undocumented assumption of the environmental degradation of herding is irresponsible and unjust, and makes a mockery of the current ideological insistence on equity in development. To make informed judgments on the ecological consequences of herding, we need longitudinal studies of agrostologic changes correlated with meteorological data, combined with close observations of pastoral and other uses of the terrain. The point is well made by Western (1974:24).

The stability of pastoral environments is more difficult to assess. It is frequently thought that pastoralism inevitably leads to overgrazing and a reduction in the long term carrying capacity of the region... The increased aridity of the Sahelian zone in recent millenia is an often quoted example of large scale degradation by pastoral overuse, either as a primary or a contributory factor. Against this, however, must be weighed the fact that pastoralists have inhabited the East African savannah ecosystems for millenia... And yet it is the so-called "pristine" nature of these environments that has attracted so much attention amongst conservationists... Most concern centers on the arid areas, such as the Sahara, but these are precisely the areas where the most unstable climatic conditions exist naturally, and where natural erosion is highest.

The fact that pastoralists exploiting arid and semi-arid habitats in widely dispersed parts of the globe -- Central Asia, Iran<sup>20</sup> and Afghanistan, Botswana, East Africa, the Sahel -- with distinct cultures and histories, have elected not to develop private ownership of the strategic resource land, whereas having quite individualized ownership of animals and often of water, would of itself lead at least to the suspicion that the systems are ecologically sounder than their critics would suppose. What are needed are facts, and the relevant facts are not available. "There has been no empirical assessment of the ecological efficiency of pastoral systems (*Ibid.*:18). The logic of the "tragedy of the commons" position is seductively attractive, but it is not necessarily empirically valid.

#### (4) Labor Constraints

The tragedy of the commons perspective assumes that there are no constraints on the increase in livestock, since an individual can only benefit from having more animals. While there may be no immediately perceptible land costs in the unrestrained expansion of herds, there may well be pronounced

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<sup>20</sup> Communal ownership of lands was not customary in parts of Iran: "Prior to the 1960s, legal rights of ownership and of use of rangelands and mountain pastures were vested either in individuals or in tribes... During the 1960s, with the advent of general land-reform, the entire nation's rangelands and pastures were nationalized, and responsibility for their allocation and control was given to the Range and Forestry Organization (FRO) of the Ministry of Agriculture... The FRO appears to have been largely successful in abolishing the payment of grazing rents to private individuals...(Sandford 1977a:5).

managerial costs. We have some idea, from the work of L. H. Brown (1971, 1977), of the lower limits of herd sizes needed to maintain demographic and economic viability, but we do not know what are the upper limits in terms of the ability of the herder effectively to manage them. Yet material from other pastoral regions (i.e., Barth 1964) suggests that the number of animals which can be herded is limited by the amount of labor that can be mobilized for that activity. We know from studies among Sudano-Sahelian farmers that the major constraint on increased production is labor, not land. Professor Wilford Morris has aptly pointed out:

The farmer is rationally maximizing his return on his scarcest resource, which in West Africa frequently is not land but labor. If he can double his yield per hectare but it takes him two and a half times as much labor, he is bound to lose before he even begins (Paylore and Haney 1976:69).

Since the pastoral household is engaged in a complex series of activities, including farming, dairying, and trading as well as herding, the amount of labor which can be mobilized to care for the animals is necessarily less than the number of able-bodied persons it contains (even allowing for the fact that very young children perform productive acts). This is especially true in West Africa where only a small fraction of the pastoral population has made a full-time commitment to herding.

An individual or household with more animals than it can reasonably manage has two options regarding the surplus: (a) it can cull them for sale or consumption, or (b) it can convey them to other persons whose managerial capacities are not exceeded. While often retaining some claim on these animals, the owner is in effect converting animals as economic goods into social and political obligations. From an ecological point of view, the

effect is to reduce the charge on the pasture made by the original herd,<sup>21</sup> by dispersing them to areas of lower concentration.

A number of anthropologists who have analyzed pastoral systems in the Sudan have pointed to managerial or labor constraints on the unrestricted expansion of herds, or have simply reported a constant upper limit for herd size:

Humr recognize an optimum size for a grazing herd. A very large one becomes unwieldy: the tail end straggles out of sight through the trees; towards the end of the dry season, when grazing may be scarce, a large grazing herd is bad because the fast cattle tramp over the small patches of good grazing before the slower cattle arrive. Humr do not enumerate their cattle, but it appeared to me that about 150 head was the largest convenient size for a grazing herd that would suit all seasons (Cunnison 1966:68-9).

Those with large herds are forced to employ herders from other households that have labor to spare. The employment of such herders may lead to diminishing returns. A hired herder may not pay the same attention to the herds as the owner would. Also the fact that herders must be paid a certain amount at the end of the year reduces the ability of the owner of the herd to maintain sufficient replacement for the stock (Ahmed 1972:182).

The size of herds varies considerably... For camels the maximum number in a single herd is about 150, and for sheep about 200. Goats, when they are not herded together with sheep, rarely exceed a couple of dozen to a flock (Asad 1964:45-58).

Writing of the FulBe of the Doukoloma Forest region in Mali, John Grayzel, currently mission anthropologist with AID/Nouakchott and then research assistant to Michael Horowitz on the Mali Livestock Project, reports:

...100 head is the normal limit for a single grazing unit. During the day a sole herder can graze this number, though his task is generally made easier since calves being weaned are left to wander on their own in a different direction. For the transhumance itself, an assistant to share work is required, with whom 200 head can be managed. Occasionally seen herds of 400 are composites, with sufficient manpower always present to split them for local grazing... At approximately 100 head, an owner's problems qualita-

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<sup>21</sup> For a literary example of how "surplus" cattle are invested in social relationships, tending toward equalizing the number of animals under any herding unit's direct responsibility, see Cyprien Ekwensi's novel of the Fulani of Northern Nigeria, Burning Grass, 1962.



tively change. The guarding of his herd is now a full time job and usually too large to combine with others. This, added to those problems that increase directly with size, such as the searching for sufficient pastures, the difficulty of drawing well water, and the not to be minimized growing jealousy of other village/r/s, make it expedient for the owner to find a particular individual to be charged with caring and moving with the herd (Grayzel 1975:25-7).

Thus there is considerable indication that there exists a carrying capacity to labor. It is important to state this as an hypothesis for testing: a constraint on herd size is the diminishing returns from unimpeded increase, reflected in such costs as predation, theft, disease, inadequate watering, as the herd expands beyond the herder's capacity to manage them. The specific limit will be influenced by the amount of labor which can be mobilized for herding, the nature of the terrain (i.e., the quantity, quality, and location of pasture and water), and the mix of animals herded, since cattle, camels, sheep, and goats all make distinctive demands both on the browse and graze and on the energy of the stockmen. Under certain conditions, a mixed herd presents distinct ecological advantages, although it may be more consumptive of labor:

There exists a large measure of complementarity in feeding amongst these species, between grazers and browsers and course and fine feeders. Commonly cattle are grazed in a long grass area which is subsequently used by sheep and goat and finally by juvenile stock. In Amboseli [East Africa] this "succession" of pasture use is most conspicuous in the course swamp sedges; Maasai tend to use these areas after trampling and feeding by elephant and buffalo have improved the structure for cattle, which improve it in turn for smaller stock. Such a "grazing succession" has been described for large mammals...and is evidently commonly practised by pastoralists with a range of species (Western 1974:17, emphasis added).

With a single summer rainy season, rather than the two rainy seasons in Masailand, the conditions are not likely to be identical in the Sahel. Nonetheless, each ruminant species is primarily attracted to a different plant population:

L'observation du comportement des animaux au pâturage montre que, selon les espèces, ils utilisent plus ou moins préférentiellement l'une ou l'autre des strates de végétation. Ainsi, caprins et camelins utilisent davantage la strate ligneuse que les ovins et les bovins... L'observation des bovins au pâturage montre, d'une part que, des quatre espèces domestiques, ce sont eux

qui utilisent le plus abondamment le tapis herbacé, et, d'autre part qu'ils recherchent une partie de leur ration dans les feuilles, les fleurs, et les fruits des ligneux, de façon de plus en plus importante à mesure que s'avance la saison sèche (Peyre de Fabrègues 1975:2-3).

#### (5) Herd Composition

While a few pastoral groups truly specialize in herding a single species, such as the sheep-herding Uda'en FulBe of Niger, most Sahelian pastoralists have found an adaptive advantage in maintaining a broad range of livestock. From the herders' perspective this mixture provides an adaptive advantage similar to that which the Sudano-Sahelian farmer attains when he or she plants a field with a variety of millet types, and intercrops them with cowpeas. The possibility of a very high yield if all the conditions are favorable is sacrificed for the probability of a reasonable return from average conditions. Different ruminant species have different disease tolerations, can go for longer or shorter distances and for greater or lesser periods of time without water, require more intense or less intense supervision. Environmentally, when the relative numbers of each species are in balance, the range is not subjected to extraordinary demands on any one of its resources. Subsequent to the last drought, the caprine herds, which in any case suffered less, recovered far more rapidly, and herdsmen who had not invested exclusively in cattle had a basic stock with which to rebuild their losses. Those who had shifted into cattle from a mixed species herd were likely to have been responding to the rising commercial arena provided by the beef-hungry coast. Prior to the last drought, more than 600,000 Sahelian cattle annually were exported to the coast, requiring repeated crossings of national and sometimes currency frontiers, and facilitated by few of the paraphernalia of modern trade (such as formal contracts and letters of credit). The active participation of herdsmen in this trade is clear testimony to their responsiveness to market opportunities.

In his excellent thesis on the impact of drought on a Sahelian pastoral society east of Lake Chad, Jean Clanet documented, among other changes a shift in the composition of herds to accommodate to the new demands of the

environment. Daza herdsmen gave up cattle husbandry in favor of camels, "better adapted to climatic constraints" (Clanet 1976?:224).

The social organizations of herding societies allow for flexible sortings of persons, and this flexibility facilitates their response to the diverse demands of their animals. That is to say, herders can organize themselves in ways which best maintain the herds, combining and recombining in varying assortments in order that the animals profit maximally. The goal of this action is not the well-being of the animals per se, but the well-being of the people who live with them in relationships of mutual dependence.

#### B. How common is the range?

An examination of the ethnographic literature dealing with African pastoralists indicates that in general individual tenure to pasture is rare. This does not mean, however, despite innumerable assertions to the contrary, that any herdsman has an operable claim on any piece of rangeland. In the broadest sense, specific areas are associated with particular groups. Access to pasture is constrained by ethnic membership; and incursions by outsiders, persons without established use rights, may be met with persuasion, force, or legal action. Customary law courts hear cases in which contenders dispute each other's jural claims to pasture, just as they hear cases in which herders protest the attempt by sedentary people to farm land traditionally considered to be pasture, or in which farmers try to obtain damages from herdsmen whose animals venture into cultivated fields. More restricted than the ethnic group, there are pastoral claims associated with specific clans, lineages, and even families.

The best known system scheduling access to pasture is the dina, codified in its present form by Cheikou Ahmadou (r. 1818-1845), governing usage of the interior delta of the Niger River in Mali. This code rigorously regulates access to and use of the vast resources of pasture which annually are in flood,

and it allows for a complex exploitation not only by herdsman, but also by farmers (who practice by flood and recession cultivation) and fishermen (Gallais 1972). P. J. Imperato witnesses the dina-regulated use of the Niger Delta in the late 1960s:

Approximately 163,000 Peul nomads participate in these seasonal movements, together with a million and a half cattle, a quarter of a million sheep, and half a million goats. Within the confines of the delta are another 250,000 Peul, semisedentary farmers and merchants who do not routinely take part in the transhumance treks, although they may do so occasionally. There are also large sedentary populations of farmers living on the periphery of the flood plains: an estimated 100,000 Bambara, 150,000 Bwa, 200,000 Minianka, 80,000 Marka, 250,000 Dogon, and 10,000 Songhai... The plains are divided into 37 districts called leydi, which are the recognized communal property of given clans of Peul. Pasturing in them is governed by a complex weave of traditional verbal agreements and conventions established by Cheikou Ahmadou, one hundred and fifty years ago (1972:63, 67; see also Gallais 1972).

Effective rights of tenure are allocated not according to broad ethnolinguistic groupings, such as "Peul," "Tuareg," but to far smaller named units identified with a particular home locale. The incredible complexity and organization of these rights has recently been reported by John Van Dusen Lewis, AID/DS/RAD, in his report to the International Livestock Centre for Africa on the "JafaraBe Burtol" (1978). Groups without jural rights to use land are required to make substantial payments, and the amount of these payments influences the direction and timing of transhumance.

...in the Lac Debo burgu of the YallaBe to the west and the JalluBe to the east, stiff rents were charged to all comers, Macina FulBe or otherwise. The JafaraBe herders around us in the Kotia gave us two explanations for their not having gone on to the superior grasses of the Debo at this time. (1) The rent, at 10,000 FM per head plus one animal (of the herder's choice and therefore an older male castrate if he has taken the precaution of retaining enough of these in his herd) and, if the herd is on the large side, a female calf as well, was considered inhospitably high. (2) The concentration of cattle in the Debo area at this time increased the risk that one's herd, while grazing or moving to and from the camp to pastures would get mixed in with stranger herds. (Lewis 1978:5-6).

The dina may be the most spectacular of these codes but it is not unique: we have, for example, the Syrian hema, which underlies a range management project in that country (Draz 1974). Lewis's material is unusual because

he followed the transhumance over an extended time, and was able to observe much of the decision-making about where and when to move. Most others who have written about the phenomenon have tried to reconstruct these decisions from discussions with the herdsman. Lewis has demonstrated once again that there is no substitute for genuine participant observation. The implication of these materials is not their uniqueness, but the likelihood that they are far more common than we have been led to believe. Any development project which aims at establishing formal tenure to pasture would be well advised to assure itself by reasonably detailed field inquiry what the existing relationships are and in what sense the proposed ones would be an improvement.

In much of semi-arid Africa, access to pasture is functionally restricted, at least in the dry season, by well ownership. In general, water belongs to the individuals or groups who build a well or who pay to have it built.

...natural sources of water such as streams, ponds, and water holes are not considered to belong to individuals or groups. In the rainy season pasture areas water can be found nearly everywhere and, except for major ceremonies, people travel in small groups, spreading out over the landscape and thereby taking maximum advantage of fresh grass as it becomes available. Wells, however, are an entirely different matter. A well is owned by the person or group that dug it or had it dug. In principle, people other than the well's owner(s) may not use its water without permission. During the dry season, the Fulani move in small circuits about the wells which they own (Riesman 1978:21).

What is the lesson to be learned from this? To some, the degradation of the range is proof that pastoral herdsmen, exploiting lands communally, inevitably destroy their own resource. From this perspective it follows that the programs to be established should be fundamentally discrepant from traditional practice. To others, however, who see the herdsmen as having been made vulnerable primarily by interventions imposed from without, what is called for are development programs firmly predicated on understandings of how the herdsmen themselves manage their resources, understandings which will be obtained only when the herdsmen become active and voluntary participants in the identification, planning, implementation, management, and evaluation of projects.

The problem of animal nutrition in the Sahel has too often been seen in terms of underavailability of water, rather than the balanced availability of water and forage. During the early 1960s, the donors undertook the construction of bore holes fitted with diesel engines to provide reliable sources of water for herds. Instead of small groups of animals dispersed across the terrain in the search for pasture and water, huge numbers of animals began to assemble around these bore-holes, particularly as the dry season progressed and surface waters disappeared, and in consequence the land for great distances around the wells was grazed to bare ground.

Each new construction of a bore-hole attracted great numbers of herdsmen. The traditional users of existing wells or ground water saw the arrival of nomads from all the neighboring tribes... The estimate of 5,000 cattle or 10,000 head of livestock of all species, intended to ensure a balanced availability of pasture, was everywhere more than doubled (Bernus 1974:124).

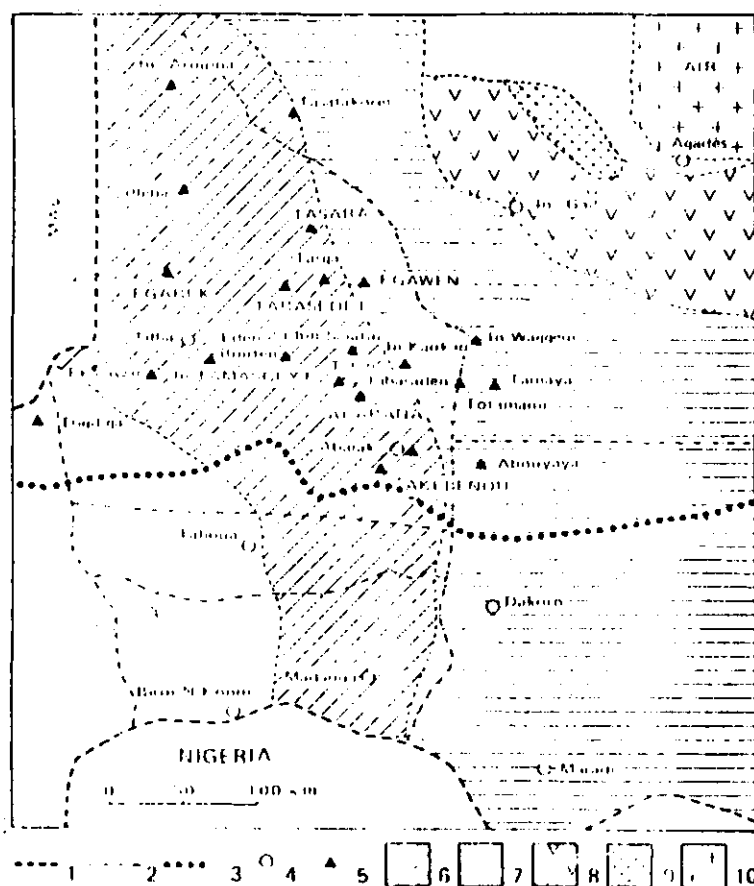
When the drought struck vast numbers of animals died for lack of food in ironically tragic proximity to the new wells (Laya 1975).

Bororo herdsmen in the region of Bermou, north of Dakoro, Niger, told me this year that they opposed any government well construction programs. They prefer to pay for shallow wells to which they will have exclusive access, as was traditionally the case, for they know that public wells attract animals from far away, from groups with whom they have not established agreements on range use, with a consequent overloading of the pasture and upsetting of the grass/water balance. If the government must build wells, they said, such wells should be placed further north, in Tuareg country. The Bororo would go there and pasture their animals in the dry season; but they do not want to reciprocate with access to their own pasture, a reciprocation that would be made inevitable by public water.

Sensitivity to the need to control the charge on pasture was reflected by the Bermou Bororo holding their 1977 worso or annual assemblage in proximity to a Tuareg well. Watering their animals from ponds, they nonetheless so heavily grazed the pasture with several thousand animals during a few days that the Targui owner was deprived of dry season pasture for his own herds. Marguerite Dupire, whose study of these people is an ethnographic classic, points out that pastoralists are cognizant of the consequences of overgrazing and take steps to prevent it. No event is more eagerly awaited than this annual coming together of lineages, an occasion for dancing, contracting of alliances (both political and connubial), and general enthusiasm. Yet these longed-for festivities [when held on their own land], are called off after only one or two days, "for the stockmen fear the destruction of pastures from too great a concentration of animals" (Dupire 1962:69-70).

The contribution to range management of privately-owned wells was compromised by the bore-holes, built by the international donor community at

the request of governments. In certain regions so many engine-driven or artesian wells were installed that the range was severely threatened by over-grazing. In the Tamesna region north of Tahoua, Niger, OFEDES installed 21 wells with pumps from 1961 to the early 1970s.



Les stations de pompage de la région nord-Tahoua

1. Frontières d'Etats. 2. Frontières de circonscriptions. 3. Limite Nord des cultures. 4. Centres administratifs. 5. Stations de pompage. 6. Nappe captive du Continental intercalaire. 7. Nappe libre du Continental intercalaire. 8. Nappe sous pression des grès d'Agadès. 9. Artesianisme des grès d'Agadès. 10. Massif ancien.

According to Edmond Bernus, "Les difficultés pastorales sont nées de la surcharge des pâturages entourant les forages. Chaque nouvelle implantation





### C. Why is offtake low?

At the outset it is useful to note that although there is general agreement that Sudano-Sahelian pastoral offtake is low compared with that of commercial beef operations in the developed world, the data on precisely what that offtake is are inconsistent and unconvincing.\* According to the Agency for International Development's Development Assistance Plan for Upper Volta and Niger (1975), the yield increased from 7 percent in the early 1950s to between 11 and 13 percent in the late 1960s. Yet neither the rate of offtake nor the rate of change is verifiable. Using information recorded on sales growth rates for Upper Volta, Niger and Mali, Shapiro (1976:13, 24) estimates a 1968 harvest of between 7 and 9 percent, a far more modest change than that stated in the AID document. Both the low guess of 7 percent and the high guess of 13 percent annual offtake are seen as unacceptably low to developing countries who look to livestock exports as a major source of revenue.

Herdsman are accused of maintaining large numbers of animals in excess of the reproductive needs of the herds. Not only are these animals, which are seen as kept for non-economic reasons of prestige, not contributing their share to the strength of the national economy, and not providing the politically desired low cost beef to domestic urban consumers, they are also considered the prime source of range degradation through over-grazing. The available data do not, unfortunately, provide final answers to the question why herders retain so many of their stock from year to year, but we have enough information to challenge the assumption of irrational behavior, and to place at least some of the burden of proof on those who would, coercively if necessary, increase the yield. The issue is critical because the

\* For example, "offtake" may refer only to that fraction of the herd which enters the commercial market to the exclusion of animals consumed by the herders themselves. This truncated definition reflects the bias that the value of pastoralism is the contribution it makes to the well-being of *non-pastoral* peoples.

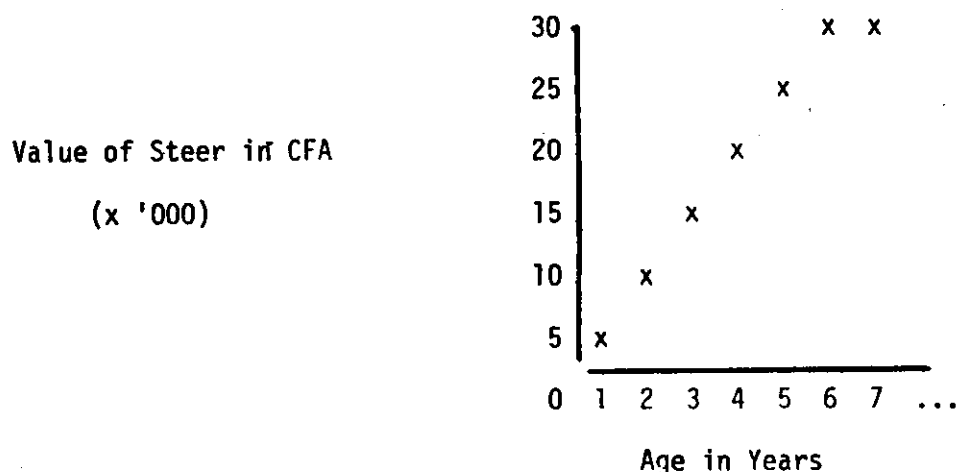
development posture of a number of states is based on the idea that pastoral practice is irrational and is the cause of secular environmental degradation. An entire strategy has been elaborated for the Sahel supported by these assumptions, in which the region is stratified into parallel zones: naisseur or breeding area in the north; engraisseeur or fattening area in the intermediate rainfall region; and consommateur or consumption area in the high income south. For this strategy to succeed, animals will have to be removed from the semi-arid range as soon as they are capable of surviving without their dams, and at the most at two years of age.

In discussing the factors which lead to low offtake, I am not going to give price responsiveness the consideration it deserves, for the data are exceptionally inconclusive. Some students feel that herdsmen set target incomes, and therefore exhibit "backward bending supply curves," in which the number of market presentations declines when prices rise (Monod 1975: 131). My own observations of WoDaaBe marketing in eastern Niger indicate on the contrary that market activity increases with price, but the material was neither comprehensive nor systematically obtained. John Grayzel did collect such information systematically for cattle sales in the Doukoloma Forest Area, and he notes a clear relationship between price and sales:

...the time and place of cattle sales is significantly influenced by national and international conditions. Thus taxes in March means there is an additional pressure to sell animals during a month when conditions already favor extensive selling, rather than in May or June when sufficient sellers are lacking. The poor quality of animals available in May and June in most markets is not because no quality animals exist, but, partially, because most are in the south, on transhumance, and are directed to the more lucrative Ivory Coast trade. The closing of the Ivory Coast frontier in Spring 1975, however, did not result in a redirecting of these animals, but in a disastrous drop in market prices that forced people to hold back from selling, and convinced them that such proposals as investing money to fatten steers for sale during these months was unwarrantedly risky (Grayzel 1976:4).

The evidence relating to causes of offtake rates is reasonably strong for a few other points.

1. Why are herdsmen reluctant to sell young stock. This question throws some light on the related issue of price responsiveness. While young animals are offered from time to time -- and a recent report (Eddy 1978:13) notes that a remarkable fifty percent of cattle offered for sale in Kao, Niger were less than two years of age -- the price paid for young stock is much less than the net price received for older animals, taking into account the increased costs of maintaining them (including taxes, water, and the risk of loss). Data from eastern Niger in the late 1960s and early drought year of 1970 show an annual increase in value of 5,000 CFA Francs (ca. U.S. \$20) from birth until full weight is achieved at about six years of age. While live animals are almost never weighed in Sahelian markets, butchers and livestock traders are skilled estimators of true weight, and the weight gain is reflected in the linear increase in value with age:



Price of Steers as a Function of Age (and Weight)

Maine-Soroa, Niger, 1967-1970.

From age six to eight or nine, with no appreciable weight increase, the value of the animal remains constant. The net value, therefore, declines. A test of price responsiveness of herdsmen would be the degree to which animals are sold off once having achieved full weight. Yet there are additional factors which might predispose the most economically hard-headed pastoralist to retain some of the old males and we shall turn to that shortly.

2. What is the relevance of inflation? Where alternative avenues for investment are unattractive or unavailable, the conversion of animals to cash whose value is eroded by inflation is hardly a sound strategy. Allan Hoben has made this point in his discussion of Masai retention of stock:

...buying cattle is the best available form of savings and investment and the best strategy for averting risk. Banking facilities are inaccessible to most Masai, and, in light of recent inflation rates in Tanzania, investing in productive goods, i.e., cattle would appear to be the only rational course of action (1976:38).

Walter Goldschmidt has proposed the introduction of tokens that would represent cattle "deposited" at a government bank, and whose value would, in principle, rise and fall with the cattle market (1975). I don't believe this innovative suggestion has actually been tried.

3. Why do herdsmen need so many animals? Understandings of herd demographic structures have recently been advanced by the exciting work of Dahl and Hjort (1976) and L. H. Brown. We are indebted to Brown for approaching the question of herd size from the herder's point of view; that is, Brown has asked what kind of enterprise are pastoral herdsmen involved in: the maintenance of a large human population directly on the income and capital of the herd. Brown simulates minimum herd sizes for East Africans totally dependent on their animals for subsistence, and while the West African stockmen consume substantial amounts of agricultural produce, and the figures must

be adjusted accordingly, therefore, the line of reasoning shows that a large number of animals of both sexes and different ages is a survival requirement:

...one can estimate the number of animals needed to maintain a family of eight on a 75 per cent milk/25 per cent meat diet (5480 liters of milk and 876 kg of meat). Neglecting what milk may come from small stock..., the milk requirement can be obtained daily from seven to eight cattle or four camels in milk. However, since the lactation period of cattle in range conditions is invariably short (usually less than six months), at least twice the number of cows (14-16) is needed to maintain a regular supply... In order to have fourteen cows in milk during the year, a breeding herd of twenty cows will be needed, if the calving percentage is about 70 per cent (a generous figure under many range conditions). To these must be added the female replacement stock, and several mature males (for it will not do to depend on one which may break his leg). In total a pastoral family in semi-arid areas must maintain 30-35 adult equivalent cattle to ensure survival from year to year. This number makes only marginal allowance for catastrophes...(1977:37).

Brown calculates a total of 31 adult equivalent animals as follows:

	Female	Male
Breeding Animals	20	2
Calves (under 1 year)	7	5
Immatures (1-2 years)	4	2
Immatures (2-3 years)	<u>3</u>	<u>1</u>
Total	34	+ 10 = 44.

With this subsistence requirement, the herding family may be hard put to maintain the minimum number of animals for survival let alone increase his stock for reasons of prestige.

4. But what about the steers? Even among those who view pastoral practice with sympathy and admiration, and suspect that pastoralists have adapted well to a marginal environment, the presence of large numbers of steers seems to render herder rationality problematic. For those without that sympathy and admiration, the retention of older males is proof of herder irrationality. Since steers make no reproductive contribution to the herd,

do not provide for herd rebuilding in times of decimation through drought and disease, why have attempts to increase offtake among castrates met with herder reluctance?

Transhumant herding in semi-arid regions is a classically labor intensive activity, and a major constraint on the herder's ability to increase the size of his flocks and herds is the amount of labor he is able to mobilize in maintaining them. As the herd expands beyond the herding unit's managerial capacity, it reaches the point of diminishing returns, reflected in a marked increase in disease, predation, theft, runaways, and an increase in the costs of watering.

The idea of manageable limits to herd size is well represented in the anthropological literature. It has been persuasively argued by Barth (1964) for the sheep-herding Basseri of Iran, and has been noted, as I have indicated above, by a number of students of Sudanic pastoralism (Cunnison 1966; Ahmed 1972; Asad 1964).

The labor crunch in the Sahel is heaviest during the later dry season, when animals must be moved regularly and watered from dug wells, and during the rainy season, when care must be taken to keep them out of the cultivated fields. Steers facilitate the pastoralists' ability to manage their herds. The as yet unpublished evidence of John Van Dusen Lewis strongly supports this view. Writing of the JafaraBe FulBe of Macina, Mali, Lewis shows that the stockmen "like to keep up the proportion of male castrates to females as a way of maintaining the stability, unity, and tranquility of the herd thereby increasing milk production and reducing labor" (1978a:18).

...the herds were showing the effects of the arduous descent from the Mauritanian frontier. The Joro's son asked me to take two calves in the back of the Land Rover for the late afternoon stretch to Togobali.

Otherwise, he said, it would be difficult to get their mothers to abandon them and advance down the burtol with the rest of the herd. As it was, after the calves had disappeared in the Land Rover, their mothers went beserk and the Joro's son had a full afternoon getting them down to Togobali. If it were not for the presence of certain steers in the herd, in whom these cows are said to place an implicit confidence, such females could not be induced to remain with the herd at all. Throughout the transhumance, these herders were explaining to me that without steers to strike out in a linear grazing direction, *their herding work would be quadrupled*. Left to themselves, the cows would run around in circles after their calves and the bulls (usually two mature bulls per herd) after the cows... /The/ junior herders explained that the prize steers were selected for their looks, their post-sahel fitness, and their intelligence. This intelligence was measured by the confidence with which these steers lead the herd away from the Delta and the Niger, that is away from a known water source, to the north into the hot July sun. When that sun is glaring, they say, the cattle do not like to leave the smell of water behind them. Only the elder, intelligent steers appear to remember from one year to the next that not only is there water up north under that hot sun, there are delicious grasses as well (Ibid.:54-55, emphasis added).

Lewis's observations, drawn from his close association with the group during its transhumance, provide a new and essential link in our appreciation of the judiciousness of pastoralist decisions about cull rates. As an interesting aside, there is some indication of American cowboys, like the Malian FulBe, using previously trailed steers to facilitate herding. The novelist James A. Michener gives us an instance in his fictive, though well researched, Centennial:

The first night went peacefully, and Mr. Poteet slept in the wagon part of the morning, while Nate Person used it in the afternoon.

On the second night there was a scare when a poorwill swooped over the restless herd, uttering its mournful cry. Several steers leaped to their feet and at some distance from any of the riders.

'Quick!' Poteet called in a low voice to Lasater, who was riding guard, and the lanky Texan spurred his horse toward the trouble, but he was not needed, because a rugged old steer with a horn spread of fifty inches, named Stonewall by Poteet, muscled his way into the midst of the troublemakers and his resolute presence seemed to settle them.

'A steer like that is worth three cowboys,' Poteet said.

'Where'd you get him?' the cowboy asked.

'I used him twice before,' Poteet said. 'You can trust him . . . like the general.'

'He knew his business,' Lasater said, and the rest of the night went without incident.

On the trail Stonewall pretty much took charge. He was a canny beast, experienced in trail routine, so that no matter where he might be grazing when Mr. Poteet waved his hat, he automatically worked his way to the front, ready to set the pace. By the fourth day the routine seemed well established (1974:454).



In addition to their contributions to herding, steers in Mali are also kept to be exchanged for access to pasture:

...rents have to be paid throughout the transhumance to pasture-owning groups in those zones through which the migrations pass. As these rents are usually paid in single animal units it is good to have unproductive cattle available to hand over as rent, should it be demanded. Otherwise, the pasture-owning group could send their representative into the herd to claim a productive animal. Therefore, transhumance as it is presently practiced precludes an optimal off-take from the herd (Lewis 1978b:32).

### Conclusion

The low rate of offtake can be understood, not in terms of prestige, but in terms of survival in a difficult environment. This is not to deny that herdsman take enormous pleasure in possessing large numbers of animals. They do. They revere them in poetry and song. But that sense of prestige, and the reputation which is engendered by being a skillful and prudent herd manager, serves to underwrite sound ecologic practice. Development programs and projects which fail to understand the fundamental logic of herd structure and herd size, given the kind of enterprise in which pastoralists are engaged, will inevitably be faced with participant resistance, and will reinforce the almost unblemished record of project nonsuccess in the Sahelian livestock sector.

#### D. What about mobility?

Most social science discussions of pastoralism today avoid sterile typologic concerns that dominated earlier thought. We know now that there is little profit in classifying herding peoples as "nomads," or even "true nomads," "semi-nomads," "transhumants," and the like. These terms do not describe discrepant ways of life. They refer rather to alternative strategies or forms of action, any one of which may be elected as the appropriate response to a given, perhaps transient set of social and

environmental conditions. The alternative strategies in reference to movement form part of the response inventory of animal managers, and do not characterize whole groups of peoples. However, the interest in typology had the virtue of focusing on movement as the major technique for efficient exploitation of semi-arid grasslands. Stenning, who studied the Fulani in Northern Nigeria, identified three characteristic forms of movement among herding peoples: transhumance, defined as "regular seasonal movements," for example from northern pastures in the rainy season to cropped fields in the dry season; migratory drift, "gradual displacement of transhumance orbits;" and migration, "the assumption of new transhumance orbits by a sudden and often lengthy movement" (1957). Associated with free movement is necessarily the notion of free access to pasture. This association causes distress among those who see in it only the selfish destruction of shared resources. It is supposedly not to the advantage of any given herder or group of herders to reduce the numbers of animals and lessen the charge on the pasture. Improving pasture conditions locally is seen as an invitation to others to bring in their animals. Yet there is beginning to appear a counter position. Biologist D. H. Janzen writes: "Some studies even suggest the 'overgrazed' pastures may have a higher overall yield than more carefully managed sites, especially if the real costs of management are charged against the system" (1973:1214). Western argues in a similar vein:

Pasture quantity and quality have been shown to have a high annual, seasonal and spatial variation in arid savannahs. A given site will show a much higher variation than the region as a whole and a static system of ranching would experience a greater absolute fluctuation in pasture conditions than mobile forms. However, mobility will only confer an advantage if it can obtain a higher production than a sedentary livestock economy in which stocking rates are adjusted to overall range carrying capacity.

It is well established that a pasture is more nutritive during the growth than non-growth stage...; the plant mass contains a higher component of digestible crude protein and carbohydrate...

A very real advantage can therefore be derived from mobility geared to select growing pastures--a high proportion of the forage can be assimilated rather than passed through as faeces.

The same pasture may be 70% digestible when green, 30% when dry, a low utilization in the green phase will mean a loss of potential, consumable energy. Mobility is primarily a strategy to maximize the intake of high-digestibility forage, leaving till last that of low digestibility. This strategy has resulted in the successive use of habitats in the African savannahs... In effect it reduces the effect of the highly seasonal growth cycles, and ironically it is the highly spatial variation in precipitation that permits this! The sensitivity pastoralists have of pasture differences and variation is extremely high because they can monitor marginal differences by milk output (1974:12-13, emphasis added).

It has not been established that there are viable alternatives to current mobility practices, and we must look critically at development proposals which seek to restrict movements without convincingly providing alternative adaptations.

One of the consequences of the drought is that whereas the Sahelian governments and the international donor community are convinced that the herdsmen had too many animals and therefore were unable to withstand the drought-induced decline in pasture, herdsmen are equally convinced that they had too few and were therefore more vulnerable than necessary. Given the requirement of a minimal herd size to support a family, the stockman who had 20 animals and saw them reduced to 10 had to drop out of his desired occupation and way of life, whereas the man with 40 who also lost half had the basic stock with which to rebuild.

Mobility and the concomitant access to pasture are the most significant adaptive strategies evolved by arid and semi-arid zone pastoralists because of the enormous and non-predictible variation in quantity and distribution of rainfall, which results in tremendous variation in the availability of graze and browse. The IBP research area in the Ferlo, Senegal, experienced this variation. Average annual rainfall in the Ferlo fluctuates between 200 and 300 mm.

Variation of plant production and theoretical carrying capacity for cattle,  
at IBP research station, Fété Olé, Ferlo, North Senegal

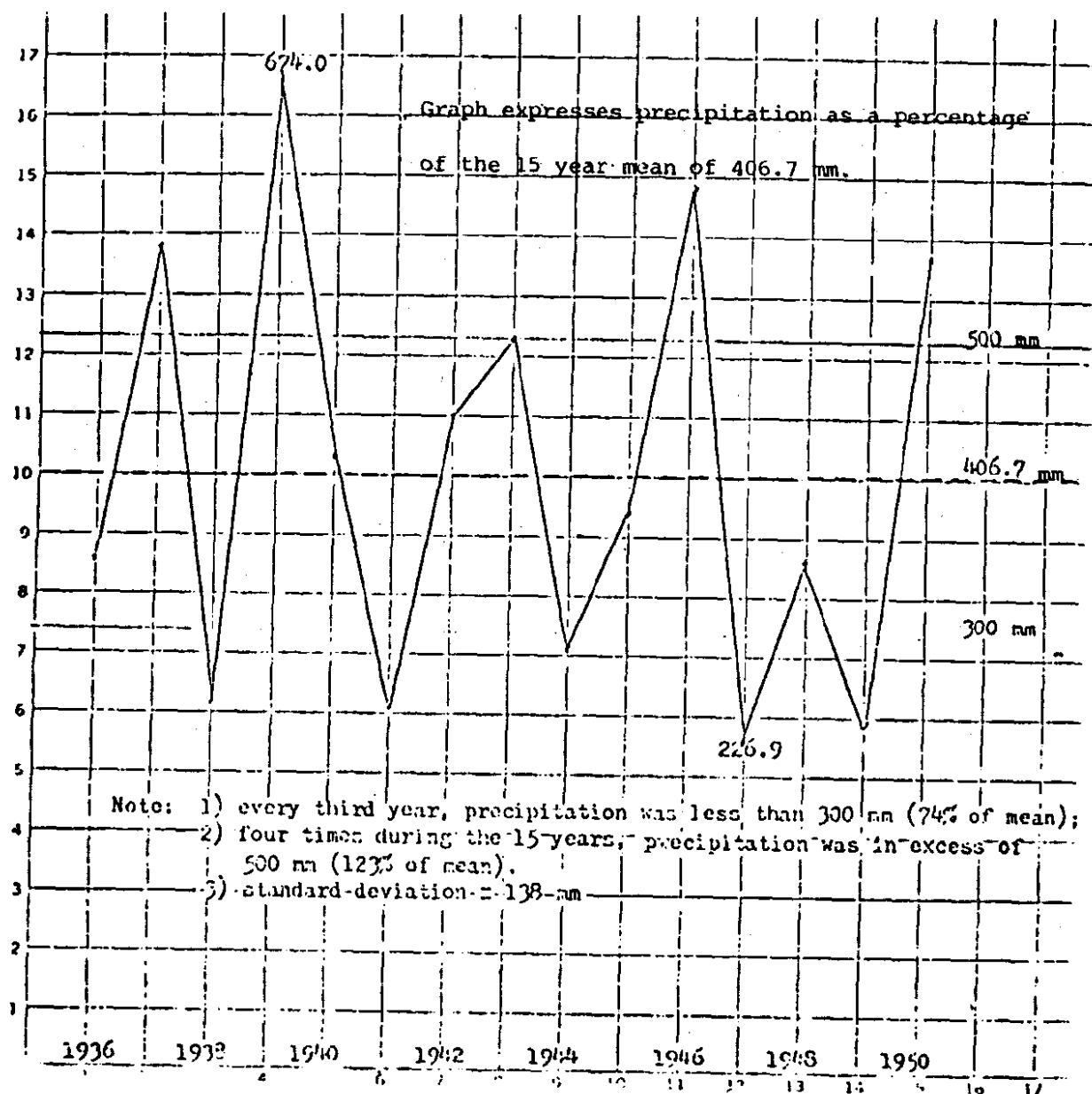
	Period of useful rainfall (days) <sup>a</sup>	Above ground plant production (kg dry matter/ha) <sup>a</sup>	Theoretical carrying capacity for cattle (number of cattle per 1000 ha) <sup>b</sup>
"Normal" good year	110	1,300	187
"Normal" bad year	50	590	87
1972	0	0	0

<sup>a</sup> from Bille, J. C., 1974, Recherches écologiques sur une savane Sahélienne du Ferlo septentrional, Sénégal: 1972, année sèche au Sahel. La Terre et la Vie 28:5-20.

<sup>b</sup> Calculated assuming animals of 250 kg liveweight, eating one-third of above ground primary production. (Swift 1977:458).

A herdsman locked into the Ferlo in 1972, without the right to move, would have lost 100 percent of his stock. To minimize the loss in such a year, the rational strategy is to move from the rainfall deprived area to one more favorably treated. Yet the fundamental development posture of many planning and donor agencies attacks this strategy by restricting or attempting to restrict animals to a specifically demarcated piece of land. Take for example the World Bank Senegal project. In a region which exhibits quixotically variable rainfall and, consequently, plant cover, a range management program is underway in which some 1.4 million hectares will be divided into 65 grazing units within which the herders -- "a group of 100 families of eight members on average..." -- will be required to remain permanently. The managing corporation is vested with the power of the State to assure the inviolability of the boundaries around each unit. While such a program may be reasonably well adapted to the better years, it clearly raises concern for the poorer.

Climatic variability is characteristic of the entire Sahelian zone. In Mainé-Soroa, Southeastern Niger, where I carried out studies of nomadic-sedentary relationships in 1967-1969, data from ORSTOM provide the following pattern for the period 1936-1950:



Every third year, total rainfall was less than 75 percent of the 15 year average; four times during that period it exceeded 125 percent of the mean.

Not only is the total amount of precipitation highly variable, it also varies in temporal and spatial distribution. In 1949, Maine-Sora had 230 mm total rainfall; total precipitation for Diffa, some 50 km further east along the same latitude, was only 67 mm. Thus contiguous areas can experience

much difference, and the ability to move from one to another is critical for animal survival. Within a year at any given location total rainfall is less significant than "useful" rainfall, which refers to its distribution during the rainy season. This, too, is highly variable:

Mean annual precipitation for the decade 1961-1970 at Mainé-Soroa was 431.6 mm during forty days of rain, most of which fell during July and August.

<i>Year</i>	<i>Total rainfall in mm./days of rainfall</i>	<i>Percent of fall in July-August</i>
1961	564.6/18	89.1
1962	483.6/36	90.2
1963	362.5/18	66.0
1964	650.4/38	87.7
1965	271.7/37	67.8
1966	432.1/12	66.3
1967	490.8/36	86.5
1968	343.7/17	46.8
1969	224.4/35	58.2
1970	492.2/32	67.5

$$\sigma = 125+ \text{ mm}$$

$$\sigma = 5.6 \text{+- day}$$

Precipitation was highest in 1964 when 650.4 mm fell during 38 days, and lowest in 1969 with 224.4 during 35 days. This extreme variation in an environment so dependent upon its brief cultivating season, means that the farmer has little assurance that any particular strategy about when to plant will result in the optimal harvest. Not only is the total variation great, as can be seen in the standard deviations, but the farmer has no indication from the first onset of the rains as to what will follow. For example, in 1969 rains fell successively on the 11th, 12th, 13th and 16th days of May. Most of the farmers had sown their fields, but rain did not fall again until the 24th and 28th days of June, and much of the seed was therefore lost. On the other hand, in 1965, which had the second lowest total rainfall of the decade, the rains began on June 6th, and continued to fall on the 10th, 12th, 13th, 14th, 16th, 20th, 22nd, 24th, and 25th, which allowed the seedlings a firm hold. In 1967, one of the high years with 490.8 mm, there was only one day of rain in April, one in May, and two widely separated days in June. Then 332.5 mm fell during 14 days in August (Horowitz 1972:107).

Studies of cattle transhumance from the Malian Delta to the Mauritanian Sahel indicate that those animals who participate in the trek, despite the vast distances which are covered -- more than 1000 km every year! -- return in better physical shape than the good milking cows and their calves which remain in the village throughout the year. "The food supply for these cows seems to be worse than for the herd which migrates in the Delta and further--

more they are plagued by ticks. When they rejoin the herd at the beginning of the dry season, they are in a worse condition than the other cattle. Most probably this adversely affects both birth rate and calf mortality" (Bremner, Diallo *et al* 1978:14).

#### E. Who are the chiefs?

The issue of herd management and mobility provides a convenient peg on which to examine chieftancy in African pastoral societies. Many development documents exhibit a "take me to your leader" optic; they advise getting the approval of traditional chiefs for any proposed changes, under the assumption that the rest of the community will follow along. Few pastoral societies are in fact so hierarchically organized. On the contrary, the more likely situation is that there is no individual who has the authority to tell any other member of his community how the latter should handle his animals. Many pastoral societies have no centralization of managerial decisions relating to access to grazing lands and water, and therefore to herd size, composition, and movements. Such a people are the widely dispersed Bororo or WoDaaBe in Niger.

All WoDaaBe claim membership in a single patrilineage; that is, in principle, WoDaaBe stipulate descent through men from a common ancestor. The patrilineage is not a unitary structure, for it is subject to continuous fissioning, forming the system known to anthropologists as "segmentary opposition," first described in detail among the cattle-herding Nuer of the southern Sudan (Evans-Pritchard 1940). This form of organization in Africa is frequently associated with an extreme decentralization of authority, such that enduring corporate linkages among the members occur only at the least level of segmentation, the "fraction". For example, in Eastern Niger, a

number of WoDaaBe primary lineages are found, such as the Suudusuka'el, the bi-Bedenke, the bi-Ute'en, the Sobankkoye. To outsiders, a BoDaaDo (sing. of WoDaaBe) may communicate his identity at that level. But these primary lineages have few corporate functions. Their members might share a set of cattle brands;<sup>22</sup> they might find each other at annual assemblages following the rainy season; they recognize each other as having closer putative kin ties than they have with WoDaaBe of other primary lineages. They do not form tightly-structured pastoral groups which control access to water and pasture. That control, such as it is, is vested in the fraction, the small group of closely and patrilineally related nuclear and extended families which normally coordinate their daily and seasonal movements. Dupire, who worked with WoDaaBe near Tahoua, noted that lineage fissioning keeps the fraction to a manageable size:

Les segmentations du lignage primaire sont motivées par des raisons d'intérêt surtout économique. Lorsque les campements deviennent trop nombreux, le chef ne peut plus assurer le contrôle et les rassemblements deviennent extrêmement difficiles étant donné les conditions de la vie pastorale. C'est pourquoi au Niger la fraction est numériquement peu importante (Dupire 1962:282).

It is likely that the fissioning of lineage segments serves a major ecological function: to maintain the decentralization of decision-making regarding the management of any given herd. The herd manager -- who may be a single adult male -- decides where the animals pasture, how long they remain there, how often they are watered, which animals are castrated, which are culled, etc. These decisions are made on the basis of locally available and processed information. The herd manager monitors the quality of pasture, largely through milk production, and moves his animals when he decides that a

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<sup>22</sup> "Mais cette communauté de marque n'a plus aujourd'hui aucun rapport avec une structure collective de la propriété (Dupire, Peuls nomades. Paris 1962:287).



better quality pasture is available elsewhere. Rainfall is highly variable in time and place. Given the great disparity of pasture quality within what appears to be very close areas, it would clearly be dysfunctional to have herd management decisions made by persons who are not privy to local micro-ecological data. Fragmentation of lineages keeps authority very close to the physical and socio-political conditions to which the herd must react.

The WoDaaBe fraction, led by an arDo, is the basic unit of seasonal movement. The largest fraction censused by Dupire in western Niger reached some fifty encampments; the average fraction numbered some 218 persons. The arDo is not a chief in the conventional sense of the word. There is no hierarchy of chieftanship, no lamidat among the WoDaaBe, as there is among the Muslim FulBe, whose chiefs are ranked in terms of their descent from persons installed by Usuman Dan Fodio following the great jihad of the early 19th century. The arDo has the prestige to attempt to persuade but he does not have the authority to command, not even among the few members of the fraction who are necessarily his close patrilineal kin. The arDo is more likely to give voice to decisions reached by the community of adult men, than to impose or attempt to impose on them his own will. The WoDaaBe have not elaborated any system of chieftanship in which persons other than the herd owner/manager stand in a privileged relationship to decision-making regarding the nature, movement, and well-being of the herds. The ecological system, with its uncertain and frequently deficit rainfall, encourages a fragmentation of lineage structures into small groups which can most efficiently exploit the terrain. Associated with this fragmentation of lineage structure and the opportunistic use of pasture, is a decentralized organization of leadership in which the "chiefs" have little actual power to enforce decisions. Members

of such a community will voluntarily participate in a development project to the extent that each individual herd manager sees it to his (and his animals) advantage to do so. Even among more stratified pastoral societies, such as the Tuntunmanko'en of eastern Niger, which does recognize the lamidat system of chieftancy, chiefly authority does not impose itself on questions of herd management.

Paul Riesman, who studied the Jelgobe in the Upper Volta Sahel, makes the point aptly:

...the anarchic political organization indeed makes it difficult for a country to administer the Fulani or negotiate any kind of consistent economic, health, or educational program with them. But it is important to understand that both Fulani political organization and their love of independence contribute significantly to the Fulani ability to take advantage of the economic resources of the sahel. People who were brought up to always be told what to do, or who didn't feel comfortable unless lots of people were always nearby, would not make good herders. We have seen that the land is best utilized when people and cattle spread out to the maximum degree, and for this to happen people have to be relatively independent of one another, able to make their own decisions and take their own risks, and like being in that situation (Riesman 1978:28).

#### F. What about women?

Dieu créa la Vache, Il créa la Femme, Il créa le Peul.  
Il mit la Femme derrière la Vache et le Peul derrière la Femme (Sow 1966:285).

Herder participation in the identification, design, implementation, and assessment of livestock sector projects has been marginal, at best. Participation of women has been non-existent. Whereas the role of women in agriculture has been well noted, and even perhaps exaggerated to the point where men appear to be denied any contribution to cultivation, the role of women in pastoral societies has been simply ignored in the development documents we have examined. This is most unfortunate, because the position and status of women in pastoral societies is threatened by the very objective of many of the productivity oriented interventions: converting the economy from one which

emphasizes dairy production and the feeding of the herding population directly on the produce of the herd to one which emphasizes meat production and the feeding of urban populations.

The high rates of calf mortality under semi-arid range conditions in Africa have been attributed in part to competition for milk between the calf and the pastoral population. Where a large population is fed on slender quantities of milk, calves may suck only that milk which is surplus to the needs of the family. During the rainy season, when both grass and groundwaters are abundant, there is sufficient milk for the people, the calves, and for sale directly or as sour milk, butter, and cheese. Derrick Stenning, in his monumental study of the pastoral Fulani of Nigeria, underscored the importance of milk production and the role of women in relation to it:

Good husbandry for a Fulani herd-owner thus involves maintaining a milk yield sufficient to support his dependants at all seasons. Lactation must not only be adequate, it must be continuous. Since lactation is dependent upon the birth of calves, the main interest of the herd-owner is in a steady yearly increase in his herd... The supply of milk available to calves and humans has to be controlled by careful milking. Among the WoDaaBe the division of these tasks between the sexes is clear-cut. Men have to do with cattle, their seasonal movements, daily pasturing and watering, and veterinary care. Women have to do with milk and its marketing, in addition to their domestic tasks of food preparation and the care of the homestead both at rest and on the move. Adult men are herd-owners and managers, male children and adolescents are herdsman. Adult women are dairymen and purveyors of milk, female children and adolescents are dairymaids. The WoDaaBe family is a herd-woning and milk-selling enterprise.

Given this strict division of labour, and a herd of a certain size, a herd-owner's family must attain a size commensurate with its responsibilities towards its herd. It must also maintain a balance of the sexes, so that these responsibilities may be efficiently carried out by appropriate members of the family (Stenning 1959:102-3).

In a beef herd, the calf has the prime claim on milk, or rather, the calf is a surrogate for the urban consumer of beef. It is thus essential, when advocating increased emphasis on meat production, to assess the nutritional

impacts on the herding population in general, and the specific economic costs to women in particular. Let us explore the latter briefly.

Stenning tells us that Fulani women are responsible for marketing of milk and milk products; men are responsible for the marketing of animals. Whereas both these activities occur under the traditional pastoral enterprise, in fact women enter the market more frequently, albeit each transaction is small, and in the aggregate contribute substantially to the total income of the household. Now even if the total income were to increase with greater emphasis on beef production, an often stated though seldom demonstrated proposition, the contribution of women would of course decline. They would lose both control over the income from dairy sales and the status attendant on making decisions relating to the family's food supply. My student Mary Hooglund, who examined the final design report for the AID Eastern Senegal Bakel Range Livestock Project, concluded that if the project were implemented:

Women would be left without an important labor input into the family economy and without control over family resources. As the status of women depends practically on their position in the subsistence system and symbolically upon the number of milking cattle at their disposal and on the related number of decorated calabashes hanging over their bedsteads, the status of women in general among these Fulani would suffer. The status of individual women whose husbands join the project will decrease in relation to other women who have more milk cows at their disposal (Hooglund 1977:4).

Where the position of fifty percent of the society is placed in jeopardy, it is fair to assume that pastoral women, particularly the outspoken independent Fulani and Twareg women, will be the most reluctant participants in these projects. The question remains why have projects gone from identification to implementation without ever facing up to their impacts on women (and children)? As Paul Riesman says that "the less visible women's sphere cannot be ignored... The effect on the life of women -- and thereby on the whole family as a pro-

ductive unit -- of such changes as greater orientation to beef production or commercial milk-marketing schemes would have to be carefully thought through and preferably discussed with all parties before being tried" (1978:27).

AID is currently supporting a brief field study in Sudan by development anthropologist Muneera Salem Murdock, who is examining the impact of a series of interventions involving extensive irrigated perimeters on women of the pastoral Shukriya. Fluent in Arabic, Murdock is in the field at this writing, and the results of her studies should prove instructive to those concerned with the implications of development projects on women.

Although women have also been ignored in village livestock projects involving small ruminants, the effects are likely to be more encouraging where women already have managerial responsibility for the sheep and goats penned near the house and fed on household refuse and nearby forage.

### G. Are There Problems with Mixed Farming?

The higher rainfall and therefore greater productive potential of the cropping zone presents interesting possibilities for the expansion of animal husbandry among farmers. Various proposals call for the introduction of animal traction, with either cattle or donkeys; feeding of cattle (embouche bovine), and feeding of sheep and goats (embouche ovine and caprine). Where tsetse flies make risky the introduction of zebu cattle, embouche bovine has focused on the trypano-tolerant Ndama breed; these are generally too small, however, to pull a plow. Because these proposals seem genuinely oriented to increasing income among small farmers, responding to the equity mandate, they generally get a good critical press. They nonetheless present a number of problems which must be ventilated and resolved. In the last few years several excellent studies have been carried out which substantially advance our understandings of the issues.

A large part of the African ruminant herd is owned by villagers. Where agricultural and pastoral peoples come into frequent contact, as, for example, in the transitional ecological zone between 600 mm and 300 mm, pastoral herds often number animals whose owners are farmers. In the case of cattle, with the exception of a few yoked oxen, they are almost invariably consigned full time to a herder, who removes them from the cultivated area during the growing season to pasture them on rainy season Sahelian grasses and to keep them away from cultivated fields. In Niger, Manga, Hausa, and Djerma farmers invest in cattle, who are then consigned under herding contracts to Fulani and Buzu pastoralists. The herder receives milk and some of the young animals in exchange for his labor in pasturing and watering. Any costs, such as cattle taxes or anti-parasitic drugs, are borne by the owner. The contract may call for the herdsman to pasture the animals on the farmer's cropped fields, grazing the stubble and manuring the ground.

This ethnic/ecologic segmentation has been well described for Niger and for other parts of the Sahel (Horowitz 1972, 1975; Diarra 1975; Delgado 1977).

Interventions which envisage an expansion of cattle husbandry among farmers must carefully account for the existing system which tends to separate the farmer from his cow. In other words, we must understand why farmers, who appreciate the value of livestock, consign their care to pastoral specialists rather than care for them themselves. Why do the farmers, who appreciate the value of manure, deny themselves access to it other than during the post-harvest period when the herdsman, sometimes for a price, are willing to pasture cattle on the cropped fields?

These questions were raised with peasant farmers at a Union Nigerien de Credit et de Cooperation-organized seminar at Maifarou, Niger. The farmers were unanimous that, while in principle, embouche bovine is attractive, it is accompanied with substantial costs which were perceived as out-weighing the benefits:

a. The financial and labor costs of watering and feeding cattle are too great<sup>22</sup>.

b. The labor costs and financial risks involved with keeping animals out of one's own and, more importantly, one's neighbor's fields during the growing season, plus the financial and social costs should the cattle actually

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<sup>22</sup> Dōkī, duk sāhiyā, bākin shan shi sha tūlū. Jakī, duk sāhiyā, bākin shan shi sha tūlū. Akwiyā, in kā sayi gōma, tūlū biyu ya nā bad da ita. Amā sāhiyā, in tā kay uku, hudū, tūlū gōma bā ya bad da ita. Kuma ciyowā, duk sāhiyā ka nā iya ka sayi ma dōkī ta may kan dōkī. Jibī bā kā sayā ba: ta kwan biyu da shi, ta kwan uku da shi. Amā sāhiyā, in kā sayi ta dalā ishirin, kamin sāhē say ta cinyeta murtukē rabi, ta ci rabi. Gōbē har ila yaw say kā sayā. Amā wanda ya kē dāji, ya sakē ta ta ciyō da kanta. Kuma ta kōmō ta kwānā a hīlin. Har ila yaw, da sāhē ya sakē ta ta kōma. Shī nē ya sā a kē zamā da su a dāji.

A horse will drink a pot (of water) in the morning. A donkey will drink a pot in the morning. If you buy ten goats, two pots are sufficient for them. But if you have three or four cows, ten pots will not be enough. As for fodder, in the morning you can buy 25 francs worth and give it to your horse. You will not have to buy more for several days. The fodder will last three or four days. But you can buy 100 francs of fodder for a cow, and before the next morning it will all be gone: half of it eaten and half of it wasted. The next day you must buy some again. On the other hand, those who are in the bush leave their cow to graze freely in the morning and she finds her own food; then she returns and spends the night with him, and the next morning again he lets her graze freely. That is why we keep cattle in the bush (i.e., and not in the village). Hausa transcript provided by P. Easton.

penetrate and damage the crops, are very high. Even households with children old enough to watch over the animals rarely are in a labor surplus condition during the rainy season, since the demanding tasks of field preparation, planting, cultivating, and harvesting are compressed into a few months. In Niger, Manga and Hausa farmers feel that raising fodder crops is a luxury they can ill afford, the return being less than for groundnuts and cereals, and that crop residues are insufficient to assure a steady supply of food. Christopher L. Delgado reported similar findings among Mossi farmers in the Upper Volta:

...the production of a perennial forage crop is ruled out by a dry season in excess of six months. This means that farmers cannot rely upon a fenced pasture throughout the year. If animals are corralled, they must be fed with forage produced during the growing season; this competes for productive resources with other farm crops. Research shows that under these conditions the farmer maximizes cash profits by growing and selling crops rather than by feeding livestock with the produce of his fields (1978:1).

Because the opportunity costs of stock raising by farmers are so great in the region studies, Delgado recommends against its encouragement where farmers have access to pastoral specialists to whom they can consign their herds.

The traditional peasant-herder relationship allows the farmer to invest in cattle at little opportunity cost of resources other than that of the capital involved. It also offers employment in their chosen occupation to the Fulani, a factor which should not be neglected (*Ibid.*:5).

The high costs and risks associated with embouche bovine are thought by some to be brought into a reasonable range when associated with ox-traction, the animals then contributing not only manure but also labor to the farming enterprise.

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<sup>23</sup> [In the market town of Kao, Niger, about 100 km northeast of Tahoua,] "even if the millet crop is not successful, the prevailing land tenure system guarantees the farmer certain rights to the land he has planted. The most important of these rights is the ability to collect for damages done by animals when herds wander through the fields. Damage suits are handled in the first instance by sedentary village chiefs, and decisions are generally adverse to the herders. Judgments are enforced by armed Nomad Guards stationed in villages in the southern pastoral zone during the crop cycle. The herders themselves are held responsible for the fine, which is a fixed amount for each animal found in the fields" (Eddy 1978:6).



In a series of informal bush seminars with Gourmanche farmers in the Eastern ORD during 1974, we explored the question of animal traction and embouche. The following summary, along with the transcripts, was prepared for use in implementing the Eastern ORD Integrated Rural Development Project.

The Eastern ORD project recommends the introduction of animal-drawn ploughing and cultivation, in order to (a) increase the amount of land worked per unit worker, and (b) increase productivity per unit land. The movement from the hoe to the plough is a recurrent objective in many development projects, and it is frequently associated, as in this project, with a movement toward mixed crop and animal production, embouche paysanne...

The transcripts of the seminars point out quite clearly that although the people accept the idea of larger yields due to animal traction, they are skeptical that they themselves would be able to support the activity, either in cost or in manpower. The cost of a plough and a pair of oxen is greater than the peasant believes he can afford, when he calculates both the acquisition and the maintenance of the team and equipment. The Gourmanche appear to be highly individualistic, not at all given to the kind of corporate groupings of persons which seems to characterize the Bobo participants in the Matourkou project... They did not seem at all able to respond to suggestions that they form combinations to share the costs and to cooperate in the operation of the equipment. While they were willing to entertain the idea of receiving the animals and tools as gifts, they seemed unwilling or thought themselves unable to make any investment, such as a down-payment, of their own. There was some thought that if someone owned the equipment and made it available for rental, those who wanted to would avail themselves of the opportunity. But in fact there exists a team and plough in the village and no one, not even the owner, is using it.

There seems to be a reluctance among most Gourmanche to get involved with cattle, where some sort of confinement is required. Oxen appear especially frightening. People do not want the hassles with neighbors which occur when one's animals enter another's fields and eat the growing plants. Women, we are told, are totally unable to handle oxen. There was somewhat greater receptivity to the idea of donkey traction which, while productive only where the soils are thin and sandy, does not require the same startup costs as oxen, and does not engender fear among the farmers. One cannot, of course, practice [an exportable] embouche with donkeys, so the long-run costs of donkey cultivation may be even greater.

Gourmanche individualism shows itself strikingly in the fragmented atomized approach to productive activities. Men do not seem regularly to cooperate beyond the nuclear household, and the people claim that the households of young farmers -- who were those who showed the most interest in new methods of farming -- were particularly deficient in the number and kinds of persons who could handle the animals. As we noted above, women are considered incapable of ploughing or even leading the animals. This fact, a shortage of relevant labor, has been mentioned as a major cause of the failure of culture attelée among the neighboring Mossi:

Une force de travail réduite (3-4 personnes actives en moyenne, en majorité des femmes), l'âge élevé des chefs d'exploitation (45 à 50 ans) et la fragilité des exploitations (très sensibles à toute maladie ou tout départ d'un de leurs membres) sont autant de freins à la diffusion de la culture attelée et réduisent notablement sa "clientèle potentielle". Elle exige la participation

d'au moins 2 à 3 personnes actives, ce qui élimine une part importante des exploitations et, en particulier, la plupart des exploitations dirigées par de jeunes adultes: mariés à l'âge de 25-30 ans, ils devront attendre au moins 13 à 14 ans avant d'être aidés efficacement par leurs fils, tandis que leurs frères cadets partent en Côte d'Ivoire ou ne tardent pas à fonder leurs propre exploitation (Remy 197 :514).

It is significant to note that even the Peul farmers, who ostensibly are familiar with the handling of oxen, with keeping animals fed and out of their neighbor's fields, were not enthusiastic about hitching them to a plough or cultivator.

Thus both local attitudes toward and the labor demands of animal traction, coupled with the high startup costs, require that careful study, field trials, and extension work will be called for, before large scale attempts are made at its propagation. Although the profitability of traction/embouche appears clear on paper, much more thinking is necessary about the means of their introduction and about the problems we have identified (Clark, Horowitz et al 1975: 3-5).

A very useful series of semi-annual reports of the EuroAction Accord embouche bovine project at Liboré, Niger have been produced (Wardle 1977), which explore in considerable detail the problems relating to credit and repayment. The project was expatriate managed, and profited from close proximity to the Niamey market. According to its managers, the project is successful in that the farmers repay the credit and come back for more, with animals properly gaining weight and value. It is not associated with traction, perhaps because tractors are already in use on irrigated rice fields near the village.

Agricultural economist Merritt Sargent reminds us that official statements, remote from the scene, need not closely correspond to reality. Drawing on his extensive experience as a Peace Corps Volunteer in the country, he writes in his initial report on the use of animal traction in Benin:

Perhaps the most serious weakness in the UNDP/FAO publications on the animal traction project in the Atakora Province is their lack of reference to what actually farmers do with their oxen. There is a tendency to imply, in their documents, that simply because approximately 400 plows have been sold in my survey area as of January 1, 1977, those plows are being used. This is particularly a dubious implication in the case of weeding tools... This tendency to assume that simply because a farmer purchases a given tool he uses it for its intended purpose is not restricted to UNDP/FAO. The Agricultural Service as well as other international assistance agencies which have participated in the project have made, at least implicitly, the same assumption. It is very misleading (Sargent 1977:4-5).

The intriguing discovery that farmers continue to buy plows which they do not use is left without explanation, at least in this initial report.

When I was directing the sociological research component of the Mali Live-stock Project, I asked research assistant John Van Dusen Lewis to comment on the use of animal traction in the region. Lewis submitted the following report on "The Status of the Ox-Drawn Plow in Dukolomba". Because it illuminates a number of the problems with which we are dealing in this report, and because it has had a very limited prior circulation, I am inserting it in its entirety.

The Status of the Ox-Drawn Plow in Dukolomba

John Lewis, April 29, 1975

Dukolomba, Mali

The historical absence of the plow in West Africa has provided a basis for some important misconceptions about traditional agriculture in that region. A common feeling has been that if Africans had only known about the ox-drawn plow, they could have improved their lot long ago. This belief, however, was nourished by an ignorance of African history which has since gone out of fashion. Given the history of the Western Sudan, then, it seems impossible that the Sudanese could not have known, since at least the beginning of the Christian era, about the ox-drawn plow in wide use in North Africa at that time.

Some who accept the likelihood of this trans-Saharan awareness, nevertheless argue that Sudanese blacksmiths were not technologically competent enough to make plows. These same blacksmiths, however, began to make effective rifles as soon as they learned what was required. And, furthermore, now that the plow is at last seen as economical in some circles (see below), these blacksmiths are now making the plow itself in their traditional shop with age-old tools. Although these locally made plows are more fragile than the European make, their inexpensiveness has found a demand among the poorer farmers who work the softer, sandier, stumpless soils.

In short, the hazards of the diffusion of cultural techniques cannot be used to explain the absence of the plow in Sudanese agriculture. Its rejection had an economic basis which is of particular interest since some of these same economic constraints still operate today.

Below I will present some technological and sociological evidence from Dukolomba on factors impeding the acceptance and utilisation of the ox-drawn plow. The different combinations of these impeding factors with the much more celebrated factors encouraging the use of the plow...determine, at any given point in history, whether or not the use of the plow will be economic. An appreciation of the financial impediments to the purchase of the plow and oxen will be taken for granted here, the discussion that follows being nothing more than a consideration of the conditions under which it becomes economical to overcome them.

A. Technological impediments to the acceptance of the plow.

Every farmer interviewed has either offered or admitted that "the plow tires the soil more quickly than the hoe". This fact would constitute an impediment of some degree to plow acceptance even if land were abundant enough which it isn't, to permit frequent field abandonment: the labor saved by the plow remains less

than that expended in clearing a new field (according to informants). Boserup (The Conditions of Agricultural Growth, 1967), if I remember correctly, bases her discussion of the rejection of the plow by traditional African cultivators on a similar observation.

Those farmers who wish to sound modern and advanced wave this constraint away by saying that fertilizer can easily correct this soil fatiguing effect of plow use. When pressed for particulars, however, they admit that they can afford neither chemical fertilizer nor the cows, carts, and labor necessary for the application of sufficient natural fertilizer to their large bush field. When pressed further, one farmer suggested frequent field abandonment with fallows so short that the additional clearing work would be limited. He was thinking of the short composting fallows used at the agricultural extension centers. He was at pains to add, however, that such frequent moves would make the important job of cooperative field guarding between neighboring field owners more difficult, since they would diminish the chances of the neighbors farming in the same area at the same time.

Agricultural extension personnel in the region are equally unrealistic in their efforts to sound modern. They say that if the farmers were "educated" to adjust the depth and width regulators on their plows to suit their particular soil conditions, then too much of the topsoil structure would not then be exposed to decompose on the surface. It appears, however, that the success of this "education" is a function of the quality, and therefore of the price as well, of the plow involved. Even with a prohibitively expensive plow, however, to break the resistant "black clay" soil of Dukolomba at all, a deeper plunge than entirely necessary for producing an optimum stand of millet is required. Thus with plowing, the soil is worked out more quickly than is necessary for the production of a same amount of millet.

Three types of soil structure are recognized as significantly affecting farming practice in the Bani region: "red sane" on the southern, more recently alluvial side of the Bani; with "black clay" on the north bank grading off into "white sand" 20-30 km north of Dukolomba. In the two sandier areas not only is the depth of the trough made by the plow more easily regulated, since the soil is less resistant, but even if it were not so controllable, the farmer has less to lose in any case, since it is more necessary to expose subsoil to the crop in a sandy area. However, there are some qualifications to the overall desirability of plowing in the sandy areas, although they are not as serious as those that intercede in the "black clay" zone. Plowing the softer soil of the sandy zone, one cannot make mounds as steep or troughs as thin as is possible with a hoe or in the clay zone. Thus fewer millet rows per hectare can be planted, with more clearing labor and more land space being required to maintain productivity. Weil notes the same drawback to plow use for sandy soils in the Gambia ("The Ox-Plow in Central Gambia," in P. McLoughlin, ed., African Food Production Systems, 1970:251-252). Otherwise, however, it would seem that the introduction of the plow should encounter less resistance in the sandy areas than in the clay zone. In order to explain the exceptions to this rule we are obliged to go beyond a consideration of the technological constraints governing its acceptance to an analysis of the sociological ones.

To fully understand the advantages of the sandier soils with regard to plow use, one has to be introduced to the Bambara practice of filakè. Filakè means "second made"; it is the mound made with the same hoeing strokes as accomplish the

final (usually the second) weeding. Thus the newly hoed-down weeds get packed into this "second made" mound to ferment and compost throughout the dry season until that mound receives the seeds of the next season's millet. In addition to ensuring the fertility of the mound rows to receive the new seeds and that no seeding will be done in the tired mound rows supporting the preceding stand of millet, the four to five quick hoe strokes which made a filakè also conserve labor since no new mounds have to be made in those precious moments between the first rains and seeding the following season. Since the implementation of the filakè practice requires the cultivation of the same field space for two successive years, its advantages discourage the early abandonment of a field site. Such mobility would limit the number of adjacent cultivating seasons which could be straddled by a filakè.

Now, if the plow could make filakèw while weeding at the same time, as does the hoe, so much the better; none of their advantages would be lost and much labor would be saved. Where there is a sufficient consistency of sand in the soil, most plow owners make their filakè with the plow. However, they are restricted to doing this somewhat earlier, when the standing millet is not too high as to interfere with the passage of the oxen. Thus, the plow filakè season remains somewhat shorter than the hoe filakè season. This time loss is somewhat compensated, nevertheless, by the fact that, while a hoe-made filakè is most easily formed the day after a heavy rain, a plow can continue to make filakèw for a few more days after the rain before the ground gets too hard for it.

The "black clay" soils are said to lose the humidity of the rains more quickly than the sandier earth. Thus, in Dukolomba all but one plow owner refuse to make their filakèw with the plow for fear that the roots around the young millet shoots will be exposed to too much dryness if soil between them and the surface is removed to make the new furrow. Characteristically, agricultural extension officers, national and expatriate, whose centers are in sandier areas, and filakèw plowers to the north and south attribute this reluctance to Dukolomba's "backwardness". Yet the plowowners here prefer to wait until the millet is too high for the oxen to pass, at which time the roots are deeper and safer from being dried out, before they hoe up their filakèw, even though it is considerably harder to hoe in the clay than in the sand. Also, by waiting to make their filakèw, the farmers of Dukolomba and environs in the thickest part of the clay zone, risk getting caught with only half of their filakèw made by an early end of the rains. Even so, they do not risk plowing or even hoeing these "second mounds" earlier. It is hard to say whether or not some would risk plowing their filakèw under better rainfall conditions, since there were so few plows in the thick clay zone before the drought. Those few who had plows did not risk it.

Since the sandier soils are said to retain more moisture longer, plow owners (a higher proportion of the farmers in these zones - see below) are willing to make more of a cavity next to the young roots of the standing millet, and thus they plow their filakèw. We have already seen that, if so desired, this plowed cavity can be kept shallower in the sand in any case.

Given, then, that a plow owner farming "black clay", being less likely to plow his filakèw, will save only half the labor from his purchase that a plow owner in the sandier areas has saved, and given that the plow tires out clay soil more quickly than sandy soil (since it is harder to keep the plow from cutting deeper into the more resistant clay at the same time as it is less desirable for it to

do so - see above), one would expect the plow to have an older and wider distribution in the sandier areas. To a certain extent this seems to be the case. However, the drought has introduced a further complicating technological factor. Since in the "black clay" zone millet yield responds positively to an increase in rainfall, whereas in the sandy zone - particularly the "white sand" zone - millet output suffers from an overabundance of rain, heavy rains before and between the dry years gave the clay farmers somewhat more of a surplus with which to ride out the famine. The "red sand" zone (where millet suffers less from heavy rains than in the "white sand" zone, in any case), being south of the Bani, experienced less drought than those zones north of the river. Thus it was the "white sand" zone which felt most strongly the effects of the drought and, therefore, suffered a relative loss in plow purchasing power. Consequently, although it may be twice as desirable to have a plow in a sandy area as opposed to a clay area, since the drought, one does not find, other things being equal, twice as many plows. Variations from a distribution of plows according to ecological desirability, which cannot be explained by the differential incidence of the drought, require a sociological explanation.

#### B. Sociological impediments to the acceptance of the plow.

When the elders of Dukolomba, upon being confronted with the ox-drawn plow by the French, told the laboring youth of the village that the "cow hoe", as it is called, would wear out their soil too quickly, they, as we have seen, were not lying. But it wasn't just the soil that they were trying to economize on. As the decision makers, but not the laborers, in the family firm, these elders felt that with the labor-saving device of the plow they would lose control over the youths who, feeling less needed by the family, would drift away, either to the Ivory Coast or into their own separate firm. Thus in purchasing a plow, the elder would lose not only its price but also control over labor which he could use to advantage throughout the year. The youths were to be shamed into staying at home by the spectre of famine which would result from their being absent during the mound-making and the weeding season. Both elders and youths concur on this explanation of Dukolomba's early avoidance of the plow.

However, some youths called their elders' bluff and set up their own concessions or went away to the Ivory Coast anyway, forcing those elders who could afford it and who, not unrelatedly, had enough cows, to buy a plow. Those family heads as yet unconverted to Islam have been able to keep their youths from voyaging, and they are the only ones, of those who could afford it, who have still resisted buying a plow. But like conversion, plow purchasing has only come recently to Dukolomba. Most plow owners still regard the ties of interdependence which unite the family labor force as more valuable than any other asset.

Now, with eight plows in Dukolomba and more coming in every year, the unified family labor force seemed threatened with obsolescence by the labor-saving device. However, the recent commercialization of peanut production in the area has given the extended family cooperative work force a new lease on life. The exploitation of wide family and village exchange labor ties can get a larger peanut field seeded sooner than can the isolated, small firms which earlier resulted from the erosion of the large cooperative firms into more commercially competitive fragments.

These smaller firms abound in the newer villages and hamlets where there are fewer restraints on their formation; a newer settlement is but an assemblage of fragments broken off from an older one, with smaller family firms and fewer elders

to restrain their further fragmentation. Ecological conditions being equal, a newer village accepted the plow more quickly than an older one like Dukolomba. The younger head of the small, colony firm feels he can cultivate and control more millet if he is on his own. Since he not only makes the decisions but also labors, he gains more personally than an elderly retired head by the purchase of a labor-saving device.

Elsewhere Lewis shows that these younger farmers running their own operations are better able to afford the risk of greater commitment to cash crops, not because they have the necessary food reserves but because they are more independent of village-supplied labor, and therefore more autonomous and less dependent on status and reputation.

The arena of mixed farming that exhibits the most promise and poses the fewest sociological problems is, curiously, the component which received the least attention prior to the drought<sup>24</sup>. With the exception of the chèvre rousse of Maradi, whose hides have been commercialized for many years, and which has therefore been an object of considerable concern both to the Government of Niger and to the French livestock advisors in that country, the small scale production of sheep and goats has been generally neglected. Livestock Services have been oriented toward cattle. Yet small ruminants have been raised both by herdsmen and by farmers, and local consumption of meat is far more likely to be goat or, especially at the Moslem feast of Tabaski, mouton than beef.

Focusing on small ruminants, which is currently an interest of the Club du Sahel and the donors, is attractive precisely because it meets our criterion of building to local strength. Because embouche ovine and caprine are only now moving to the front burner of the development stove, there are tremendous gaps in our knowledge. The goat, especially, has had a very bad press, having been singled out above all other grazers and browsers as an environmental nuisance. Yet the goat has certain very real advantages, as an efficient converter

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<sup>24</sup> "Jusqu'aux années 1970, les petits ruminants d'Afrique intertropicale n'ont pas beaucoup intéressé les services techniques de Santé et de Production animale, et les experts chargés d'élaborer des projets de développement" (Dumas 1978:1).

of low quality feed into high quality protein:

Goats appear to be more effective at grazing selectively than any other domestic livestock species. There is evidence that, of the two species, goats utilize poor quality forage and browse better than sheep. Certain breeds of goats have a high tolerance to trypanosomiasis, and probably other diseases, thus permitting use of land not available to other domestic livestock. In addition, certain types of goats have lower water requirements and greater heat tolerance than most domestic ruminants (Oltenacu et al 1976:5; see also French 1970 and ILCA 1977).

The greater survivability of goats over other ruminants under difficult conditions is well appreciated by African farmers, who also note other advantages of goats (and sheep) over cattle: they provide a greater return on capital because they mature more rapidly, the kid and lamb more frequently and, with goats, there is a high frequency of twinning; they require less water and can utilize efficiently small fallow fields, village refuse, and household kitchen waste; their meat can be consumed by a small group at a single sitting, without the risk of spoilage; because they are sold for less (although the per-kilo price can be as high or higher than that for beef), a farmer can penetrate the market with relative ease when he or she has need of small amounts of cash; they can be herded or guarded by young children who would have a more difficult time with cattle. Small ruminants are sometimes the special province of women.

We thus applaud the current attention given them.

At this point it is appropriate to note a glaring omission in the development documents we have examined. Nowhere have we been able to find any concern for the possible contribution which camels could make to increasing pastoral income and Sahelian self-sufficiency in food production. This is remarkable, given the prominence which camels have had in the semi-arid sub-Saharan ecosystem. According to World Bank statistics, the camel population of the six Francophone Sahelian countries plus Nigeria numbered 1,557,000 in 1974. Converting that figure to animal units (1.5/camel) there are 2,336,000 cameline animal units, more than 20 percent the number of bovine animal units. Is this omission a reflexion of the disinterest of West African urban populations in the consumption of camel meat?



## IV

## Conclusions and Recommendations

Anthropologists have been struck by recurrent characteristics of pastoral societies in Africa which appear to have fundamental relevance for development.

Among these characteristics are:

- ° Mobility.
- ° Traditional constraints on access to rangelands and to water.
- ° Decentralization of authority, especially regarding the movement and welfare of animals.
- ° Flexible social organizations which facilitate mobilization of labor to exploit a range of ecological opportunities:
- ° Complex patterns of animal exchange and circulation, through gifts, loans, tribute, sale.
- ° Elaborate relationships with sedentary farmers, traders, and townspeople.

In addition to noting these characteristics, anthropologists and other social scientists have proposed functional relationships between them and the conditions of ruminant herding in semi-arid range lands. These relationships may be posed as a linked set of propositions:

1.1 Under conditions of semi-arid grazing of large and small ruminants, in which the quality of pasture and the availability of water is highly variable in time and space, mobility conveys greater survival value than sessility.

1.2 The quality of pasture is closely monitored (through milk yields), and herds are moved when that monitoring indicates better pasture is available elsewhere.

1.3 Broad access to the range facilitates that movement.

1.4 Pastoralists do recognize differential claims on water and range use, and their movement is constrained by those claims.

2.1 A prime function of the herd is to maintain a large human population directly on its produce.

2.2 Secondary functions of the herd are to provide cash through sale of dairy produce, live animals, meat, and hides; to provide meat for herder consumption;

and to manure the fields of farmers in exchange for dry season pasture.

2.3 In order that these functions may be best achieved under the conditions of semi-arid grazing, a large number of animals of all kinds must be kept.

2.4 Herdsmen therefore seek to increase the size of their herds.

3.1 Despite the desire to increase herd size, there are managerial constraints of the number of animals which can be maintained under the direct control of a single herding unit. Expansion beyond that point leads to diminishing returns, reflected in an increase in disease, predation, theft, runaways, and in the costs of watering.

3.2 To some degree, herd size is maintained within manageable limits by institutionalized means of loans, gifts, tribute, and increased sales.

4.1 The systems are well-adapted to the conditions of semi-arid rangeland, with local adjustments to local conditions (i.e., specific climatic, biotic, political, economic conditions). The system makes productive an environment for which there is currently available no alternative means of exploitation.

5.1 Recent changes may have affected the adaptiveness of the system, such as:

- a. population growth;
- b. herd growth (due to veterinary interventions, although this is difficult to establish);
- c. new watering points which allowed for an expansion of range into normally unexploited areas, depriving the landscape of some reserves.

From the above listed characteristics and the propositions elaborated to account for some of them, plus the fact that interventions in the pastoral sector have not been particularly successful, one is led to a conclusion: *interventions which seriously impact upon mobility and/or which threaten the ability of the herd to support large numbers of persons, will be resisted by the pastoralists.*

*Pastoral participation in these interventions is likely to be gained only where the changes proposed are consistent or nearly consistent with local values and strategies.* While the Sahelian drought may have predisposed herdsmen to question their strategies, it also confirmed their sense that survival is supported by large mobile herds. Writing of the impact of drought on herding groups in Central Mauritania, J.-P. Hervouet noted:

seuls des groupes agro-pastoraux portant au bétail un intérêt autre que purement économique ont résisté à la période de sécheresse;

seuls les groupes qui sont partis en transhumance vers des zones non surchargées et qui ont pratiqué un encadrement strict du troupeau, au détriment de bien-être

temporaire des bergers, ont connu des pertes relativement faibles.

La deuxième observation implique la nécessité de pouvoir disposer d'une main-d'oeuvre suffisante, donc de structures d'organisation adéquates. La société sédentaire, avec la désaffection des jeunes pour les activités pastorales, ne peut pas résister; pas plus que la société maure, orientée vers la spéculation et la monétarisation et en proie à des transformations de structures sociales la privant de sa main-d'oeuvre servile. C'est dire que les causes des lourdes pertes subies par ces groupes ne sont pas entièrement à rechercher dans la sécheresse en soi, mais dans les facteurs d'évolution de la société...

Par contre, la conservation du comportement traditionnel face aux crises a permis aux Foulabé et aux Foulbé walo de s'adapter grâce à la souplesse de leur système de production agro-pastoral... Ils ont donc pu réagir par une attitude "traditionnelle" courante dans le monde des éleveurs de l'Afrique sahélienne, qui consiste à décharger les zones trop densément exploitées -- voire surexploitées -- sur des régions peu ou pas utilisées (1977:85-86).

The recent discovery that many pastoral peoples have elaborated highly adaptive strategies of rangeland access, use, and control -- in other words, rangeland management, in the fullest sense, is of the profoundest relevance to donor actions in the livestock sector. There is an emerging awareness among scientists who have undertaken intimate, first-hand studies of pastoral peoples in vivo, that strict regulation of access to scarce resources (water and grass), and limits on herd size may well be the rule rather than the exception among herding societies in semi-arid lands.<sup>25</sup> Where animal charge exceeds the carrying capacity of the range, and where environmental degradation can be demonstrated as a consequence of that excess (a determination which, the ecologists tell us, is exceptionally difficult to make with any certainty), it is at least as likely that these are the effects of external intervention as they are of the voluntary actions of herders themselves. Examples abound: the imposition of permanent high yielding watering points which invite great concentrations of animals; forced sedentarization and/or limitations on transhumance; the movement of politically favored farmers into traditional pasture lands, with a resultant compression of the range.

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<sup>25</sup> In an unpublished paper, Johnson reviews a number of ecologically sound rangeland strategies which have been reported from Ragasthan, Arabia, North Africa, and the Tibesti (1978).

From this discovery there follows an inevitable conclusion: range management interventions can and should be based, where possible, on the system of controls already practiced and understood by the people. The hima livestock development project in Syria is predicated on this principle, and required considerable political courage as well as sociological wisdom on the part of the Syrian authorities and the FAO, for it meant suspending the ideologically "correct," in Bathist terms, termination of tribal controls over pastoral resources. The superficial, too often merely cosmetic "social soundness analysis" of many livestock project papers, must be replaced by a field examination far more intensive and far earlier in the design cycle. A three- to six-week exposure by even a highly trained individual who has not undertaken previous field study among the people is unlikely to provide the understandings required. Much of the relevant data will emerge only during participant-observation during the transhumant period. Since livestock projects look for a long-term impact, it is not unreasonable to require of them an initial phase of study and research, to avoid the many failures which have characterized interventions in the sector.

Some readers might find this a too one-sided defense of the African herder and the pastoral enterprise, and search for greater balance. The report seems to argue that pastoral decisions invariably are economically and ecologically sound, both in their individual and aggregate forms. If this is so, one might ask, why interfere with the sector at all? Let me demur. I do not mean to imply that everything the herder does is rational, and that no improvements in traditional herding can be made. On the contrary, the very opportunism of the herdsmen, their experimentation with response to new opportunities (for example, veterinary medicine, the rising market for beef), indicates their own recognition that change can sometimes be advantageous. It may even be that as far as risk taking is concerned, herders are more willing to gamble than farmers. Where they are reluctant, that reluctance may well stem from their own analysis of the situation as disadvantageous, rather than because they stubbornly cling to tradition. It is important that we retain our perspective.

For example, the symbolic importance of cattle to the African dairyman is often contrasted with the economic significance of dairying to the American farmer. Is this contrast fair? Does not American dairying also have a symbolic meaning? In upstate New York where I live, dairy farming is an important activity. Hundreds of dairy farms are maintained along the Southern Tier, the vast majority of which do not support themselves. Dairy farmers are typically employed off the farm, and use their non-farm income to support the enterprise. The very farm, sold to

the sub-dividers, would yield a far greater return than when used for forage and pasture. Yet dairying continues, however unprofitable it may be. And farmers continue to purchase equipment -- for these are highly capitalized activities -- and pay rising land taxes, even though it is crystal clear to the objective outsider that only by not evaluating his labor as cash can the farmer pretend the operation pays. Even the calf losses, so characteristic of African herding, are common on the New York and Pennsylvania dairy farm: fully a fifth of new-born calves dies within the first thirty days! (Gregory 1978:1) Given the access to veterinary medicine, supplementary foods, and sanitary environments that the New York State farmer can have, one wonders if a Fulani or Maasai would tolerate such a loss rate. Is the contrast between "symbolic" and "economic" particularly useful?

The argument in the preceding chapters and the overarching recommendation of this report is that programs and projects in the livestock sector must be socially sound if they are to succeed and benefit the producing population. The overarching finding is that they are not. Only rarely, as in the commendable Niger Range and Livestock Project (No. 683-0202), has sufficient attention been paid not merely to a competent social analysis during the design cycle, but also to a long-term and continuing program of social and ecological analysis prior to the implementation of specific changes in local practice. This heavy component of study is not without its problems, for it is not always easy to identify qualified persons to undertake the work, and host governments may be impatient with "research," arguing that higher priority must be given to "action". Yet the poor performance record of projects in the livestock sector, referred to in document after document, and the faddish jumping about from bore-holes, to veterinary interventions, to ranches, to range management would seem to call out loud for the kind of study entertained in Niger Range and Livestock: both the donor and the host government have much to gain from the sequence of phasing in that project.

The studies called for in Niger Range and Livestock will be instructive beyond the specific project region, but we must not exaggerate their relevance. Similar studies are needed in other areas. The institutionalization of the social

scientist as a member of the project team is a healthy step, although it has not yet been demonstrated how social science findings become part of the management structure of the operation. Commenting on the sociological studies relating to Mali Livestock I, this point was tellingly raised by Princeton Lyman:

I have just finished reading John Grayzel's most recent report on his research... I was struck by the eminently practical, and at the same time perhaps vital suggestions he made for adjusting the approach to the forest reserve area... While copies of this report and [the project director's] valuable notations are sent to the CDO and OMBEVI, I wonder if there is a formal way in which such matters will get picked up and reviewed and become part of the project's managerial considerations... Could we perhaps build into the MIS a regular point of review and analysis of the research components, with "critical path" indicators of decision points on management that the research raises (April 3, 1975)?

I continue to be impressed with the vitally important information being developed for the Mali Livestock project... Indeed, their recommendations on supporting the organized character of village millet production, protection of village farming rights in the Forest, and group systems of credit seem to offer the difference between success and (almost assured) failure of the project. But is this information becoming part and parcel of the planning by OMBEVI and the US contract team? Will the schemes be planned and modified accordingly (May 28, 1975)?

Mali Livestock I was the first of the post-drought animal sector projects which AID mounted in the Sahel, and it is among the few which has been in operation long enough to provide a useful evaluation in terms of its impacts on the rural poor. Since parallel to the project there was a social anthropological research team which employed both host country and American researchers, and since research reports and recommendations were regularly made available to the Country Development Office and to the GRM responsible office, the evaluation should be able to assess how the field findings were made relevant to the implementation of the project. For managerial guidance on future projects, it will be useful to know who in CDO/Bamako was assigned responsibility to link up the research findings with project actions, how successful that linkage was, what unanticipated problems were encountered, and how they were overcome. Since it is unthinkable that the research findings which were so favorably reviewed in the field and in AID/W would not have been integrated into the implementation of the project, we look forward eagerly to having this most important evaluation.

It is by now a truism that a recurrent problem faced by development projects in Africa is the lack of sufficient numbers of qualified host country (and contractor) personnel, particularly at the technical and middle managerial levels. Highly qualified persons are to be found, of course, but they are often stretched thin by the sheer volume of work for which they are responsible. Training is therefore an important component of the projects. In the livestock sector, training tends, unfortunately, to follow rigid disciplinary lines, particularly in veterinary medicine and range management, and these tend to create specialists with narrow, segmentalized views. An obvious recommendation of this report is that training include field-oriented social science. The need for more host country social scientists conversant with the pastoral sector is patent and, I hope, has been telegraphed throughout this report. Every project which calls for expatriate social scientists should also provide for counterpart training. Ideally, the expatriate and the host country person should work together. Where junior scientists are used in the field, the project should have access to a senior scholar who directs the research, visits the field periodically, reads and criticizes the field reports, and provides field training supervision and additional linkage to project management.

It is recommended that where University-trained counterparts are not available, the project consider "on-the-job" training in the field in advance of formal classroom work. This method was used with the host country sociologist on Mali Livestock I; in the absence of a trained sociologist, a high school social studies teacher was provided by the Malian Government, who was then trained in the field under the supervision of a senior scientist, and then sent for formal university studies overseas. Where a number of projects make use of such persons, either within a country or within several linguistically homogeneous countries, all of the researchers might be assembled annually for an intensive seminar, in which the several development projects involved might be compared and a broader perspective achieved. Finally, host governments should be encouraged to find professional positions for the counterparts once they are trained. Again



this occurred in Mali Livestock, where the counterpart researcher was named official OMBEVI sociologist.

Training of host country social scientists per se is a necessary but not sufficient solution to the problem of designing and implementing socially sound livestock projects. All professional staff in the Livestock Services should be sensitized to the ecological and sociological realities of pastoral life in their countries. Whether veterinarian, agrostologist, hydrologist, or range manager, livestock professionals would profit immensely from an understanding of the existing herding enterprise. One approach to achieving this understanding would be the incorporation of university-level courses on the social ecology of pastoralism within current curricula. Where such training takes place within the host country, the content would naturally emphasize peoples and problems specific to the nation. There would be differences in each country, reflecting each particular situation. In general, however, the course might last a year with lectures and seminars, followed by a summer's field work, and a followup seminar in the fall. The following topics might be covered:

#### The Nature of Ecological Studies and Research

- Ecological Systems
- Adaptation and Evolution
- Energetics
- Population Demography

#### The Cultural Ecology of the Country

- Ethnicity and Ecology
- Pastoral Societies
- Pastoral Ecosystems
- Articulation of Pastoralism and the Larger Society
  - Nomadic-Sedentary Relationships
  - Marketing
  - Change and Development

#### Field Work: an Ecological Analysis of a Pastoral Community

#### Seminar: Evaluation of Field Reports.

In a country like Kenya or the Sudan, such a course could be fully staffed by host country personnel, and would have the further benefit of facilitating commun-

ication between faculties customarily housed -- as in the United States -- in separate schools: Agriculture (or Veterinary Medicine) and Letters. In Sahelian countries, expatriate staff would be required initially. There is no problem with materials, however, for both French and English literature exist in abundance.

While it is clearly important that the middle and senior level cadres in the Livestock Services be sensitized to the realities of pastoral life, that they understand the herders as well as the herds, actions are also needed at the level of actual contact between the government services and the people. It has been noted in a number of countries, for example, that following an early enthusiastic receptivity to vaccination against rinderpest, there has been a falling off, a reluctance to have animals vaccinated. Some livestock officials attribute this reluctance to herders' traditionalism, and to their feeling that rinderpest having been eliminated, there is no continuing need to trouble the animals. Since vaccination is required, coercive means are sometimes employed to have the stockmen obey the law, exacerbating relations between the people and the state. The herders have a different explanation. Nigerien Fulani told me that vaccination entails considerable risk, and has an unacceptable incidence of animal mortality. They attribute this mortality to contaminated vaccines and to improper vaccination techniques. They note that the vaccinators are frequently very young men, poorly trained and conveying disinterest in their work, and often from ethnic groups with traditions of hostile relations with the pastoralists. (In Niger, almost no WoDaaBe attend school, and are unlikely to enter any form of civil service.) There is a need thus to bridge the perceptions of officials and herdsman, especially where there is no inherent conflict but only a misreading of each others' intentions. The course in pastoral ecology, aiming at an understanding of the conditions of pastoral life, is one approach to a solution. It is also useful to work from below.

To work from below we suggest the establishment of a corps of paraveterinary and range workers drawn from the herding groups. Each group has some members who are reputed to be particularly knowledgeable in the diagnosis and treatment of animal diseases, and who are sought out by their neighbors in times of need. Such individuals could be given training as paraveterinarians, under the supervision, in the Francophone countries, of an infirmier vétérinaire or an agent d'élevage. (The parallel to the village health team's sécuriste, which is being broadly extended in the Sahel, is obvious.) Where herders are organized in Pastoral Associations, as called for in a number of recent projects, the Association itself might elect persons from among its members as "bare foot veterinarians" (or perhaps as sécuriste vétérinaire). The Livestock Service should provide short term training courses in the vernacular. On completing the course, the sécuriste vétérinaire would provide front line first aid, health, and referral service, and offer a two-way information conduit between the people and the officials. Provided with knowledge and a medical kit appropriate to their level of training, they could handle basic veterinary services in the bush, provide information about sanitation, deparasitization, genetic selection, supplementary feedings, etc., and refer to more skilled and better equipped persons cases beyond their competence. The same rationale which justifies the village health team approach would seem fully appropriate to this also.

For this system to operate properly it is essential there be adequate back-stopping and periodic retraining and upgrading of these front line workers. To facilitate that training it would be useful to undertake inventories of traditional knowledge in the animal health field, which would produce manuals of ethno-veterinary medical practice. The literacy services in the various countries might cooperate in the preparation of these manuals, starting with a review of the available literature<sup>25</sup>, and supplementing the review with field inquiry as necessary.

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<sup>25</sup> A brief glance at the French literature includes such references as Bernus 1969, Dupire 1957, Ristorcelli 1939, Ligiers 1958.

The completed manuals would present vernacular concepts of health, disease and curing, pointing out where the vernacular classifications differ from those of Western veterinary practice. This is important, since translation is not simply a matter of finding the corresponding word, but of determining how categories are formed and how items are classified. The lack of such understanding can lead to gross, albeit inadvertent, errors in communication.

This report has been critical of donor practice in the livestock sector. It has attributed the poor success of livestock sector interventions to fundamental discrepancies between the assumptions commonly made about pastoral behavior and the social and ecological realities of African pastoral life. It has asserted that if that track record is to improve there must be a far better articulation between those realities and the interventions. This is desirable from every point of view.

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